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The report on the Chicago track elevation work which is printed on another page is taken from a volume prepared by the track elevation department of the city. It is of especial value and interest, since it is the first thorough report of this character to be prepared concerning this great work. The reader will be impressed with the fairness shown, and the credit given the railways for their willing co-operation and their promptness in executing the work, once the preliminaries were satisfactorily settled. The figures on cost are impressive, and the table giving the decreases in grade crossing accidents is, as the report states, the most eloquent argument possible for track elevation in cities. Other cities have had and are having track elevation done, but the Chicago situation is unique both as to conditions and magnitude. No other place in the world has such a complicated track and terminal system, or so many streets with heavy traffic crossed by railway lines. Information for guidance in almost any situation which may arise may be got from the methods used in solving the Chicago track elevation problems.

The New York Public Service Commission, Second District, last January ordered all steam railways to report the number of rails broken in service within the state. Figures have also been gathered covering December, 1907, and January, Feb-

ruary and March, 1908, for comparison. The reports for the months of December, 1908, and January, February and March, 1909, show a total of 1,829 rail failures, as compared with 3,917 during the corresponding months of a year ago. The reports are complete, with unimportant exceptions. Figures for some of the larger roads are as follows:

	1907-8.	1908-9.
Erie.....	473	202
B. & R. & P.....	206	102
D. & H.....	500	162
D. L. & W.....	144	96
Lake Shore.....	354	93
N. Y. C. & H. R.....	1,601	537
N. Y. O. & W.....	80	49
Pennsylvania (not including Northern Central).....	228	139

Of the 54 steam roads from which reports were received, only 32 report any rail failures. Of the failures during the past winter only four caused accidents, all of them being to freight trains. Only 75 failures of open hearth rails are reported. This striking reduction in rail failures does not add to our information as to the quality of rails furnished in 1908 as compared with those laid in 1907. Only a detailed analysis of the individual reports would show this. The totals, of course, simply reflect the mild winter of 1908-9. In the southern part of the state there was only about nine inches of frost in the ground. To a certain extent track has been kept in better shape, not because maintenance of way forces have been larger, but because better men were employed. The stopping of new construction made available during the last year so much high class railway labor that it has been possible to get picked men for track work. At present there are several thousand good track workmen looking for railway employment near New York city.

The consular service of the United States long has been a source of much more expense and discredit than of benefit to the country. While it contains competent men here and there, it is composed mainly of persons who secured their places through no special fitness but through rendering political services of one kind or another to members of Congress. The railways are directly and indirectly as much interested as any other industry in everything that tends to promote the country's business welfare; whatever increases commercial prosperity increases railway traffic. Therefore, railway men will be interested in plans that have been formulated and efforts that are being made by the Industrial Club of Chicago, of which Mason B. Starring, President of the Northwestern Elevated Railroad, is President, for legislation to improve the consular service. The Industrial Club has got bills introduced in Congress for the establishment of a National Consular School and for placing appointments to the consular service on a civil service basis. The proposed school would be maintained by the Government, and would give special instruction and training for consular work. In order to open the door of opportunity to young men regardless of their financial resources, each student would be allowed \$300 per year by the government, and to repay the government for his education the graduate would remain in the consular service at least ten years after receiving his appointment, or be subject to call for service for five years after graduation. "For war," says Mr. Starring in an article in the May *World's Events*, "we train soldiers at West Point and sailors at Annapolis, and what those sailors can do was recently emphasized in the minds of not our countrymen alone, but of all nations, when our fleet made its trip around the world. Why, therefore, should we not train our soldiers of commerce for the warfare of trade, in a governmental school established especially for that purpose?" That the consular service would be improved greatly by the adoption of some such plan as that advocated by the Industrial Club of Chicago there can be no question. But there is also no question that no such plan will ever be accepted by the public men who have been used to peddling consular appointments as part of their patronage until it is forced on them by the overwhelming

pressure of a public sentiment that has been thoroughly educated as to the needs of our foreign commerce.

The strike of the firemen on the Georgia railroad was officially declared off at 2 p. m. on Saturday, May 29, after a total suspension of traffic throughout the company lines for nearly a week and almost complete paralysis for nearly two weeks. The terms of the settlement were unofficially given out, as follows: The men to return to work under conditions existing at the time the strike began, until final adjustment is made; all negro firemen at the terminal stations to be dispensed with; all discharged brotherhood firemen to be reinstated.

Three other points were left to be decided later: First, whether negro firemen shall be eliminated from the road; second, if not eliminated, what percentage of negroes there shall be; third, seniority of negro firemen over white firemen. Both Knapp and Neill, Federal arbitration commissioners, went to Georgia, and it seems to be the general understanding that their intimation of President Taft's purpose to enforce obedience to law, with a view to free passage for mail trains, was an important element which led to a speedy compromise after the arrival of Judge Knapp. The reporters concluded that the railway company had agreed to recognize the seniority of white firemen, but with the proviso that the employment of certain negro firemen who have been with the road many years should be continued. On Monday, however, the questions left unsettled Saturday still remained unsettled, and it was agreed to appoint arbitrators. The difficulty of this situation is peculiar, even if the race controversy were far less troublesome than it is, for the relations of the parties were anomalous to start with. A railway needs a large force of firemen in training, out of which to make its engineers; yet the southern roads deliberately sacrifice this advantage, to a greater or less extent, apparently because negroes can be hired cheaper. Negroes are not promoted to be runners. The reason for refusing them promotion evidently is wholly social. If we call it racial, we may have to admit that there is a race question in the North as well as in the South; for, as one of the strike leaders observed, "the Georgia Railroad is asked to employ white firemen exclusively, as is done in the North." Again the difficulty of the situation is enhanced by the fact that the displacement of the negroes involves violation of the fundamental economic principle that negroes shall have "equal rights" as regards work. In the words of a level-headed southern leader of public opinion: "The South has always declared that it gave the negro a square deal industrially. To oust negroes from positions which they are filling efficiently and without personal friction is to repudiate this wise policy and to start a program the logical result of which is the continuing multiplication of the idle negro." It looks as though these arbitrators ought to require the Georgia Railroad to provide a permanent field of labor for the men that it turns off from its engines—though the railway manager can, of course, reply that it is not he, but his intolerant neighbors who are responsible for the trouble.

The Pennsylvania Railroad has issued a circular to the newspapers defining its attitude toward them in giving out information about accidents. News-gatherers must apply to the general office or to other division superintendents. Miscellaneous employees know only certain features of the situation, and not until all information is assembled by a central authority can it be given out properly. As to the number and names of persons injured the newspapers may be assured that the company will make them public freely and fully, but "there are many phases of accidents, especially regarding their causes, the facts of which cannot be ascertained even by the railway company until after considerable investigation and inquiry. The company will, however, give prompt publicity to all known facts." We hold no brief for the daily newspapers,

and for ourselves we are content to feed on conjecture when facts cannot be had; but the Pennsylvania officers need not flatter themselves that this will be satisfactory either to the reporter or to his employer—and we mean, now, the same reporter, not the sensation monger, the modern reporter, deals largely in matters of "human interest," and there is no use in trying to postpone discussion of causes till everything is positively known. Take, for example, a derailment at a facing point switch. The question whether the trouble was due to a sharp flange on the wheel or to a loose switch point would, in many cases, never be settled if the two different departments had their way. When an engineman mismanages the air-brakes the popular explanation is "failure of air-brakes" (*i. e.*, air-brake apparatus). Of course, the company does not want to come out and blame the runner without a hearing; but that does not warrant complete silence on the subject. The passengers are bound to guess and gossip, and the company might just as well put in a few words to clarify their guessing. In a bad derailment broken axles, bent axles, broken rails and spread rails may be all charged with being the primary cause, with little evidence as to either; but this much, padded, perhaps, with a paragraph or two about the details, would make a much better ending to the newspaper account than the ambitious efforts of the reporters usually furnish. As to the facts for which a railway company may really have strong reasons for wishing to keep from the public as long as possible we have the testimony of the Union Pacific that the excessive caution of the legal department is useless. Officers of that road have given the public free access to the investigators' hearings and have not injured their interests thereby. Even the manager, who actually is ashamed—because of poor track, loose discipline, or insufficient inspection—is not likely to be any the worse off for making a reasonably frank statement, for where these defects are readily discoverable the reporters will herald them, in spite of efforts at prevention, while if the questions at issue are obscure, or if there are facts which explain or excuse, the manager can hope for a satisfactory verdict only after he gets some unbiased critic to take up the case. Every well-meaning railway officer should favor impartial and intelligent governmental investigation of accidents.

THE CINCINNATI, HAMILTON & DAYTON TAKEN OVER BY THE BALTIMORE & OHIO.

Some of the mutual advantages, from a traffic standpoint, to be gained by the taking over of the Cincinnati, Hamilton & Dayton by the Baltimore & Ohio were pointed out in these columns in the issue of May 7. The plan, as approved by the directors of the Baltimore & Ohio and by the bond and note-holders' protective committees of the Cincinnati, Hamilton & Dayton, is given in another column of this issue.

This is apparently the final chapter in that book of rather exciting financial adventures, of which the formation of the so-called Great Central system in the latter part of 1904 was the first chapter. In July, 1904, the C., H. & D. bought \$11,000,000 common stock of the Pere Marquette, and afterward bought jointly with the Pere Marquette the entire outstanding capital stock of the Chicago, Cincinnati & Louisville. In January, 1905, the C., H. & D. leased for 99 years the property of the C., C. & L., and in March it leased the property of the Pere Marquette for 999 years, assuming all obligations of the Pere Marquette and agreeing to pay as annual rental dividends of 4 per cent. on the \$12,000,000 preferred stock and 5 per cent. on the \$16,000,000 common stock of the Pere Marquette.

The obligations assumed by the C., H. & D. soon proved burdensome, and before the end of 1905 a floating debt of more than \$6,000,000 had been accumulated. In the meantime a syndicate formed by H. B. Hollins & Co. had sold to the Erie, through J. P. Morgan & Co., \$5,000,000 common stock of the C., H. & D., the total outstanding common stock amounting to

about \$8,000,000. After the Erie had arranged to sell \$12,000,000 convertible bonds to finance the purchase, among other things, of this control of the C., H. & D., it was found that the burdens assumed by the C., H. & D. were such that it would interfere with the development of the Erie's own property to carry out the purchase. J. P. Morgan, therefore, took over from the Erie this C., H. & D. stock at a price in the neighborhood of 160, and the Erie proceeded with the sale of its convertible bonds, but used the proceeds for improvement and extension of its road. On December 4, 1905, the Cincinnati, Hamilton & Dayton was placed in the hands of a receiver, and protective committees were formed representing the security holders. The receivership extended to the Pere Marquette and the Chicago, Cincinnati & Louisville, and on December 20 the board of directors of the C., H. & D. rescinded the lease of the Pere Marquette and all agreements and obligations relating to the C., C. & L., and later the receiver of the C., H. & D., under instructions from the court, refused to assume these obligations. Since that time various efforts have been made both by the security holders' protective committees and by J. P. Morgan & Co. to reorganize the affairs of the Cincinnati, Hamilton & Dayton.

The present plan apparently accomplishes the two objects which all of the interests that had to do with the reorganization agreed were essential. It gives the C., H. & D. credit, enabling it to pay off its floating debt and acquire working capital, and it rids the C., H. & D. of its burdensome obligations assumed in connection with the Pere Marquette and the C., C. & L. This has been accomplished without the disturbance of a very heavy capitalization and without radical wiping out of any class of bonds or stock. The now rather unusual device of issuing income bonds is resorted to, however, and the readiness of the 4½ per cent. note holders to exchange their securities for these bonds will depend largely on the hopes that they may have of the advantages of a new management and a working agreement with the B. & O.

THE LOW CURVE OF RAILWAY FORECLOSURES.

In an editorial article not long ago (January 8, 1909) under the title of "The High Curves of Railway Receiverships" we pointed out some of the striking features of past epochs of business depression and their natural and logical product in many railway receiverships. Incidentally we also called attention to the fact that the \$596,350,000 of railway stocks and bonds involved in the receiverships of 1908 contrasted very favorably with the \$467,000,000 of 1876, when the railway interests of the country were relatively small, and with the \$714,755,000 of the year 1884 and the crest of the upward curve of \$1,781,046,000 in 1893. Certain figures for railway foreclosures are not only very striking in themselves but become more so in contrast with the receiverships. The singularly quick descent of the foreclosure curve is indicated if we take three consecutive quadrennial periods of the immediate past in the tables annexed:

First Period.			Total Stock & funded debt.
	No. of roads.	Mileage.	
1905.....	6	679	\$20,307,000
1906.....	8	262	10,400,000
1907.....	6	114	13,777,000
1908.....	3	138	2,547,000
Total.....	23	1,193	\$47,031,000
Second Period.			Total stock and bonds.
	No. of roads.	Mileage.	
1901.....	17	1,139	\$85,808,000
1902.....	20	693	39,788,000
1903.....	13	555	15,885,000
1904.....	13	524	28,266,000
Total.....	63	2,911	\$169,747,000
Third Period.			Total stock and bonds.
	No. of roads.	Mileage.	
1897.....	42	6,675	\$517,680,000
1898.....	47	6,054	252,910,000
1899.....	32	4,294	267,534,000
1900.....	24	3,477	190,374,000
Total.....	145	20,500	\$1,228,498,000

The swift decrease of foreclosures is obvious at a glance but the most impressive thing of all appears in the first period running back for the last four years. The railway receiverships of that time are depicted as follows:

	No. of roads.	Mileage.	Total stock and bonds.
1905.....	10	3,593	\$176,321,000
1906.....	6	204	55,042,000
1907.....	7	317	13,585,000
1908.....	24	8,009	596,659,000
Total.....	47	12,123	\$841,607,000

Thus in the last quadrennial period only about half the number of receivership lines, a tenth of their mileage and less than one-seventeenth of their stock and bond par values reached the foreclosure stage. In 1908, the low ebb year following panic, there were but three lines with 138 miles and \$2,547,000 fell under foreclosure, corresponding returns for the receiverships being 24,809 and \$596,659,000, the ratio of foreclosure to receivership being thus absolutely trivial. Contrast such a showing with the \$190,374,000 of foreclosures and \$78,234,000 of receiverships in 1900; or the \$1,150,377,000 of foreclosures and \$275,597,000 or receiverships in 1896 or the \$311,631,000 of foreclosures and \$92,385,000 receiverships of 1878. Of course there are bound to be some modifying facts in any such landscape and sweeping view backward. Foreclosures may come after a painful struggle of a receiver to set a railway on its feet, that effort extending over a year or series of years; and both receiverships and foreclosures on big railway systems in particular years affect the comparisons. Still, with all due allowance for accidental factors, it seems very obvious that in this country the ratio of railway foreclosure to receivership tends rapidly downward. Fewer and fewer railway receiverships are being forced to the point of snuffing out values and interests by foreclosure and reorganization which was so characteristic and painful a symptom of the "long drag" that followed for several years the panic of 1873.

The causes also are manifest enough and hardly need the testimony of the returns except to emphasize them. Capital is nowadays highly organized, concentrated, mobile and self-protective. The receivership, while it certifies financial trouble and depresses the securities of the railway affected, at the same time tends to shield all interests; the foreclosure, on the other hand, seeks to extinguish them or some of them. Organized capital, with its investment imperilled, will sometimes resist a receivership, sometimes seek it as a cover; but the foreclosure, that spells the complete sacrifice of interests, organized capital will resist to the last extremity. In such resistance it will prolong receiverships, appeal to the courts, in the final emergency levy assessments on itself. But there are underlying influences also, partly resting on precedent and experience, partly on the psychology of railway investment. Under the one head may be cited the wonderful example of the Union Pacific, under receivership and later assessment on its stock only a few years ago, now paying its 10 per cent. dividend and its shares risen manifold. And, under the other head of what may be called investment "mentality" is that abiding confidence in railways as *properties* which has so persisted through the last 20 months of stress and strain when legislation has joined hard times in the anti-railway attack.

The low curve of the railway foreclosures which, if so marked in hard times, seems sure to continue into better times has another more specific and limited suggestion. If it indexes protection of the junior railway security—although now and then at some risk—much more does it index protection of the senior security. The holder of railway stock or of the railway note may betimes feel a bit chilly, though far less so than he used to feel two or three decades ago. Not so the holder of the railway mortgage. He need not have deep insight to perceive that under the "protective" conditions indicated and measured by the foreclosure returns there has grown up a genuine equity that safeguards his investment. That equity is not less real because it may depend

on extraneous financial conditions and on sentiment rather than on traffic returns and capitalization. The conservative railway investor sees that equity and knows its safety values. And it is no small vantage if the railway corporation itself, when it comes to refunding old mortgage or placing new ones, finds such an investor to "digest" the new senior security.

Letters to the Editor.

THE ADVANTAGES OF MODERATE SUPERHEAT.

Paris, May 25, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Since writing you on April 30 I have seen the second part of Mr. Vaughan's letter regarding the Advantages of Moderate Superheat. I shall be obliged for the opportunity of replying to the questions raised. I now see that Mr. Vaughan does not accept the estimated engine economy for the low superheat, and my first letter must therefore be modified slightly. It still remains true that Mr. Vaughan's method of determining the boiler efficiency of the high superheat gives lower results than I found and therefore entirely fails to justify Mr. Vaughan's criticisms. In discussing the engine economy Mr. Vaughan says that he does not know of any tests which show a saving of 12 per cent. by the use of low superheat. I am reminded of the lawyer who tried to defend his client from the testimony of a witness who had "seen him do it," by the testimony of two others who *hadn't*. Apart from the results obtained in practice with the Vaucrain superheater, I may quote from Professor Perry's book, "The Steam Engine and Gas and Oil Engine," page 376, "Every test yet made of the effect of superheating shows that it leads to greatly increased economy. From 12 to 20 per cent. increase is not uncommon when the superheat has only been about 40 to 100 degrees Fahrenheit." As to the 3 per cent. deduced from Ripper's tests, it seems dangerous to work from a single series of tests without making any allowance for the difference of steam pressure and the variation in cylinder proportions. One might equally well deduce from Ripper that with a steam temperature of 400 degrees Fahrenheit, a horse power hour can be developed from 19500 B.T.U., while I allowed 24800. An examination of the figures given by Mr. Garbe in his recent book, "Die Dampflokomotiven der Gegenwart," page 223, and of those given by Mr. Toltz on page 1078 of the Transaction of the American Society of Mechanical Engineers for 1907, indicates that while the economy to be obtained increases with the superheat, yet the rate of increase of the economy is not in direct proportion to that of the superheat. This seems to be in accordance with common-sense. There is a limit to the gain in efficiency to be obtained by superheating, and as this limit is approached it becomes increasingly difficult to increase the efficiency. It is therefore to be expected, and the figures I have referred to above confirm the expectation, that equal increments of superheat will give a greater economy at low than at high temperatures. I pointed out that a considerable part of the gain in economy is probably due to the steam being dried before it reaches the cylinders, and to this Mr. Vaughan replies that it involves "a radically new theory of cylinder condensation." I thought that it was universally recognized that wet steam was one of the most potent factors in producing cylinder condensation, and it is surely immaterial how the water gets into the cylinders. *The Engineer* (London) on page 669 of the year 1908 says, "Although writers on the theory of the 'steam engine seldom agree with each other, on one point they are united, namely, that water in the cylinder is highly mischievous, precisely how no one can prove." Perry on page 375 of his book quoted above says, "It is my belief, based on a good deal of practical knowledge of conductivity of heat, that if the metal of a cylinder were quite dry when fresh steam were admitted, the surface resistance to the passage of heat would

be so great that almost no evil effects would be produced at the speeds usual in steam engines." Professor L. Marchis, of the University of Bordeaux, in his book, "Vapeur d'Eau Surchauffée," published this year, says on page 643, "If wet steam is in contact with metal which is covered with a film of water, even although the film be extremely thin, the steam and the metal will tend to take the same temperature very rapidly. On the other hand, if perfectly dry steam is in contact with metal of which the surface is also perfectly dry the exchange of temperature will be very slight and the two mediums may remain at different temperatures." It seems hardly necessary to explain that in the steam passages the entrained moisture will have no condensing effect for the walls have the same temperature as the steam, but on entering the cylinders which have been cooled by the exhaust, the moisture facilitates the conduction of heat throughout the body of the steam and from the steam to the cylinder walls, and thus has a strong condensing effect.

LAWFORD H. FRY.

Contributed Papers.

ENGLISH RAILWAYS.

BY WILLIAM WICKHAM TURLAY.

V.

FREIGHT SERVICE.

The freight cars used in England are usually small and light, carried on only four wheels, though some larger cars of the American type have been introduced for hauling coal and ore. The ordinary freight cars are designed to carry only eight or ten tons, and the majority of them are open, the load being protected from the weather, if necessary, by tarpaulins. These small cars can easily be moved by hand, and by means of turntables they may be taken into parts of docks and warehouses which would be inaccessible for the large and heavy American cars.

In comparing American and English freight rates, one must remember the different conditions prevailing in the two countries. The freight traffic in England is relatively smaller, and comprises mainly small shipments for short distances, instead of the large shipments for long distances which form so large a part of the traffic of American lines, and for which such low rates are possible. This accounts for the smaller cars and the higher rates common in England.

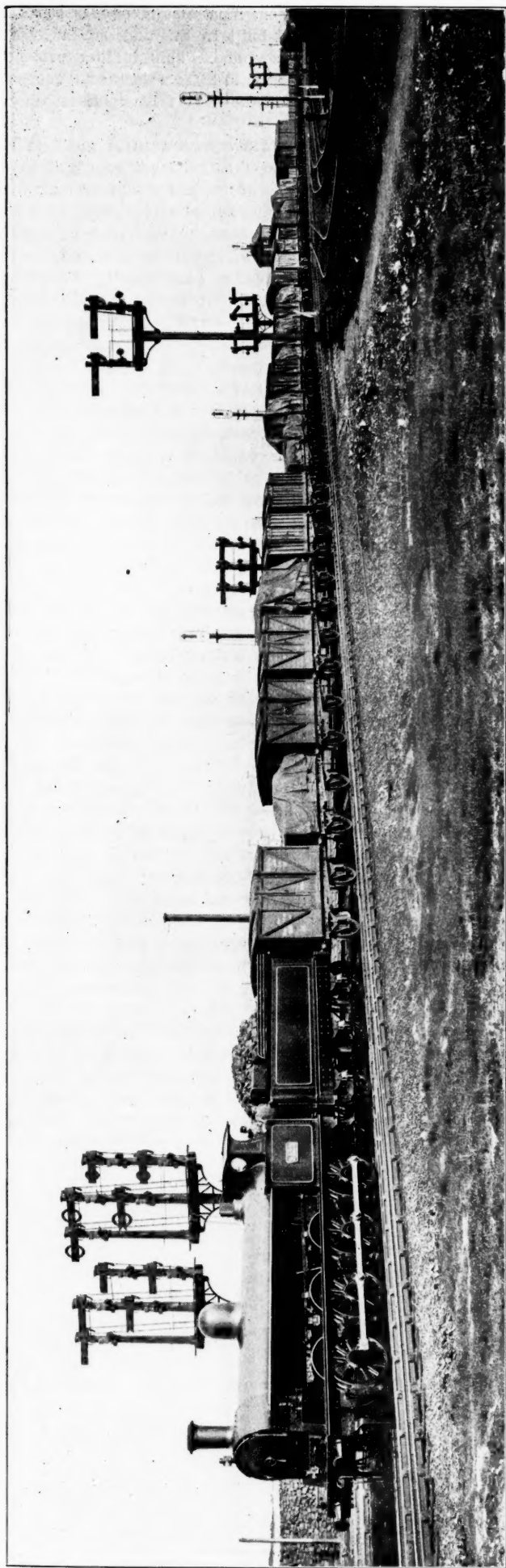
The most important things we can learn from the freight service in England are prompt despatch and delivery. Small lots of freight are collected by the railway companies' own wagons in the larger cities and towns, either from their branch offices or from the shippers' warehouses, taken to the station, forwarded, and delivered during the forenoon of the following day to the consignees by the railway company's wagons. For instance, a wholesale merchant in London can in this way have a case of dry-goods taken from his warehouse in the afternoon and count on its being delivered to his customer, a retail dealer in Manchester, the following morning, the distance being 183½ miles, at the following rates, which include cartage at both ends of the route:

112 lbs.	3 shillings ..	= \$0.72	336 lbs.	7s. 6d.....	= \$1.80
168 "	4s. 1d.....	= .98	All over 40s.....		= 9.60
224 "	5s. 3d.....	= 1.26			
per ton of 2,240 lbs., or at the rate of a little less than 43 cents per 100 lbs.					

If the goods are to go to a seaport for exportation, lower rates are charged, for instance, from London to Liverpool, a distance of 201 miles, they would then be as follows, for the same class of goods:

112 lbs.	2s. 4d.....	= \$0.56	336 lbs.	5s. 10d.....	= \$1.40
168 "	3s. 3d.....	= .78	All over 35s.....		= 8.40
224 "	4s. 1d.....	= .98			
per ton of 2,240 lbs., or at the rate of 37½ cents per 100 lbs.					

The practice of giving preferential rates for imported and exported goods causes much complaint on the part of those



Typical English Goods Train. Note Open Cars with Tarpaulin Covers.

who are thus discriminated against. English market gardeners, for example, claim that fruit and vegetables are carried from France and Belgium to London by sea and rail at through rates which are less than the English gardener has to pay from his station less than 100 miles from London. A disposition to alter the natural course of trade and commerce, for the purpose of increasing their long distance traffic, seems to be common to the rate-making officers of all transportation companies, when they are not restrained by some higher power, as evidence of such action may be found in Continental Europe, as well as in Great Britain and America.

When freight is loaded into cars, or delivered at stations by shippers, and removed at destination by the consignees, the English rates are naturally lower than when the handling and cartage are done by the railway company's men and teams. This is shown by the following comparison of rates on steel sheets, in lots of two gross tons and upwards, between London and Manchester, a distance of 183½ miles:

Cartage, etc., done by R.R. Co.—30s. 6d. (= \$7.32) per ton of 2,240 lbs.
 = 32½ cents per 100 lbs.
 Cartage, etc., done by shipper—19s. 5d. (= \$4.66) per ton of 2,240 lbs.
 and consignee. = 20½ cents per 100 lbs.

It will be noticed that all of the freight rates mentioned are for hundred-weights of 112 lbs. or gross tons of 2,240 lbs., instead of per hundred-weight of 100 lbs. or net ton of 2,000 lbs., as is customary in America.

The English railways also carry packages on their passenger trains, at rates which vary according to weight and distance, and which include collection at place of shipment, and delivery at destination. A few specimens of such rates are given below, American money equivalents being used for convenience sake.

Weight lbs.	Up to 30 miles cents	30 to 50 miles cents	50 to 100 miles cents	100 to 200 miles cents	Above 200 miles cents
1 to 2	8	8	8	8	8
5	12	12	12	14	14
10	12	16	24	24	24
15	12	18	28	38	40
20	12	22	32	44	54
24	12	24	36	48	60
*24	½	1	1½	2	2½

*In excess of.

If desired by passengers or shippers, insurance is written by the railway companies at certain advertised rates, covering loss or damage while in transit, of either baggage or freight, of such a nature or amount as the companies would otherwise not be legally responsible for.

The Post Office Department carries packages weighing up to 11 lbs. between any two places in Great Britain or Ireland at uniform rates, which include delivery at destination by carrier, as follows:

Up to	1 lb	Total charge, 3 pence	=	6 cents
1	2	"	4	"
2	3	"	5	"
3	4	"	6	"
4	5	"	7	"
5	6	"	8	"
6	7	"	9	"
7	8	"	10	"
8	9	"	11	"
9	10	"	12	"
10	11	"	13	"

This government parcels post and the fast service of the railway companies, by freight and passenger trains, provide for all such shipments as are carried in America by the express companies, and while there are some firms in Great Britain which do a general cartage and forwarding business, they have no exclusive rights on any railway.

One of the advantages which result from the fast service given by the railways is that perishable provisions, such as meat, fish, fruit and vegetables, can be very quickly and generally distributed to all parts of the country, not only to dealers, but in small quantities direct to the consumers themselves. For instance, a family anywhere on the line of a railway may arrange with a dealer in one of the great fishing ports, like Grimsby, to have delivered to it once or oftener in each week, a basket of assorted fish, such as are in season, at a fixed price, according to quantity desired, and these fish are delivered from jetty and in good condition at the purchaser's residence either by the railway or the parcels post,

the empty baskets being returned to the shipper by the railway company or by the post. A 6-lb. basket of fish costs 8 cents per pound, including all charges, and large lots are cheaper. The advantages of such a service are especially appreciated by those who live in the country, and do much to make rural life enjoyable.

ORGANIZATION AND DISCIPLINE.

While the mileage of English railways is usually much smaller than of American, it is not so much so as might be expected, because the mileage of tracks is larger there than here in proportion to the area of the country. There is a chairman and a board of directors at the head of each company, while the executive head is the general manager, who has under him a "superintendent of the line," in charge of operation; a "mechanical superintendent," in charge of locomotives, cars, etc.; a "traffic manager," district superintendents, and the usual minor officials. The titles of president and vice-president are not used.

The number of men per mile of track employed on English railways is much greater than in America, because of the density of the traffic, and especially of passenger traffic, but no place on the lines of any company is more than a few hundred miles from headquarters, and the English railway officer is able to keep in closer personal touch with his men than the American railway officer whose duties correspond with his, whatever his title may be. The great extent of some of the American railway "systems," or combinations of lines, although useful in handling long distance traffic, and convenient for the financier, does not always promote good discipline or efficiency in management, because the officers who come in personal contact with the subordinate employees, and with the public, are too far removed in many cases, both officially and by actual distance, from the chief executive officer, and are given little discretion regarding important matters. They are compelled often to employ inexperienced men, who may not even be familiar with the language and customs of the country. There are other reasons why the question of discipline presents fewer difficulties in England than in America. The employees speak English as their native tongue, and are familiar with the customs of the country. Old-age pensions (now beginning to be introduced in America) are generally given to retired employees, thus putting a premium on long and faithful service, while 20,000 of the employees have served in the army and have had the benefit of military training and discipline. There is also usually a surplus of men looking for employment, and a larger field for selection of applicants. The results of all this are apparent in various ways, even to the casual traveler.

GOVERNMENTAL CONTROL.

English railways are under the general supervision of the Board of Trade, a department of the British government whose duties with regard to railways are somewhat similar to those of our Interstate Commerce Commission, now a part of the Department of Commerce and Labor. It employs experts who investigate accidents and complaints, and while its recommendations are not mandatory, they are quite universally complied with.

No English railway company is allowed to issue new stock or bonds, or even to change the proportionate amounts of outstanding stock and bonds without the consent of the Government. This wise provision, which protects the stockholders and bondholders from depreciation in the value of their investments and the general public from overcharges in rates to pay dividends and interest on "watered" stock and bonds, is one which President Roosevelt has urged on Congress to adopt, and it is unfortunate that some of our financiers have seen fit to oppose him in a course which would accomplish so much for the protection of all honest people and enhance the credit of our securities both at home and abroad.*

*We do not think that any effective protection has been given the investor by this supervision in Great Britain. Intelligent supervision of new capital issues is pretty well beyond the powers of a government

The consent of the Government must also be obtained before any new railway lines can be built in England, either by an existing company or by a new one. This further protects the investors and the general public from loss and expense caused by the building of needless lines from motives which are not for the general good.

PUBLIC VERSUS PRIVATE OWNERSHIP.

While the street railways on the Continent are quite generally owned by private corporations, the steam or long distance railways are almost always owned and operated by the various states or countries, the only important exception being France, while even there the Government already owns some of the lines and will probably soon acquire the others under an option which it holds. In England these conditions are almost exactly reversed. The street railways are almost always owned and operated by the municipalities, which also frequently own the water, gas and electric light plants, while the general Government through the post-office department owns the telegraph lines and many of the telephone lines. This has all come to be accepted quite as a matter of course, such opposition as there is being manifested chiefly in newspapers which are the organs of financial interests which do not like to have such profitable fields closed to their activities. The steam, or long distance railways, throughout the whole of Great Britain and Ireland, and the underground railways in the London district are, on the other hand, all owned by private corporations and will probably continue to be, as the interests of the public are protected by the Governmental supervision already referred to. The Socialist party in Great Britain, which is strong only among the poorer residents of the large cities, naturally advocates public ownership of the public utilities and cites in particular the result of public ownership of railways in Prussia, where the state railways during the last fiscal year after paying interest to the amount of \$73,250,000 on the bonds issued for their purchase, besides paying all operating expenses, earned a profit of \$57,000,000, which was turned over to the public treasury and, of course, reduced to that extent the amount to be raised by taxation.*

GENERAL CONCLUSIONS.

It must not be imagined that the conditions of railway operation in England are ideal. Shippers demand lower rates, travelers want still more and faster trains, and shareholders want larger dividends, while the employees through their organizations ask for shorter hours and larger pay. These conflicting interests have to be reckoned with by railroad managers everywhere. We have seen that the English railways have had a much longer experience than ours in dealing with the problems incident to a thickly settled country. We can perhaps learn more from them than from the railways of Continental Europe because the English roads, like our own, are owned and operated by private corporations and because the manners and customs of the English people are also more nearly like our own.

The American public will be quite justified in demanding a number of improvements in the service furnished by our railways. Some of these improvements can be and should be made at once, while others, involving changes in construction of locomotives and cars, can only be made by degrees without unreasonable expense. All of them are practicable and would probably be profitable as well. Those we would propose are as follows:

Corridor compartment cars combining all the advantages of the ordinary American passenger cars with those of the old style European cars without the disadvantages of either.

Platforms at stations to be built on a level with floors of

office, even in a small and compact country like England. We believe that the British regulations have greatly promoted the safety of travel (although at a cost which would have forbidden much of the railway development in this country), but we have seen no evidence that they have benefited the investor or encouraged new enterprise.—EDITOR.

*Possibly—it depends upon the accounts.—EDITOR.

cars, doing away with car steps. This has already been done on our elevated and underground lines in cities and will involve also:

Foot-bridges over or subways under tracks to enable passengers to cross in safety from one side of the station to the other.

Side doors in cars in addition to those in the vestibule to facilitate access to and from cars, prevent crowding and reduce length of stops.

Improvement in arrangement of berths in sleeping cars. A beginning can at least be made by providing berths for women and children in compartments or state-rooms without extra charge.

Diminution of needless noise and smoke. Bell-ringing and whistling cannot be entirely done away with while grade crossings remain unprotected, but black smoke represents wasted fuel and can be reduced.

Increased joint through service of ordinary cars by shortest available routes. This great convenience involves co-operation by competing lines in some cases and may then be difficult to obtain except by means of Government control.

Promptness and reliability in the movement of freight. Our freight service, especially for small shipments, is disgracefully slow and uncertain and shippers are compelled to pay the rates charged by the express companies when prompt delivery is desired. There is no good reason why freight shipments should not be exchanged within a radius of 200 or 300 miles between the afternoon of one day and the forenoon of the following one. If a slight advance in rates was found necessary there is little doubt that merchants would be willing to pay it if assured of a fast and reliable service.

The reader may naturally ask why greater safety is not also insisted on. It is quite true that the percentages of accidents to passengers, employees and trespassers on American railways are appallingly high in comparison with those shown in European statistics. This is due to a great number of causes. The operating officers of our railways have long been working hard to raise the standard of discipline among the employees—a matter of the highest importance as regards safety—and have made good progress in this direction, but there remain many other causes of accidents, some of which are wholly or partially beyond their control, such as inferior track and rolling stock, lack of proper signal apparatus, violent storms, innumerable grade crossings of railways and highways, the migrations of a horde of tramps, and, most important of all, perhaps, the hurry and recklessness—not to say lawlessness—unfortunately so common among our people. Many of these sources of accident are incident to a comparatively new country and their evil results will only become less numerous by slow degrees.

AMERICAN RAILWAY ASSOCIATION.

The revised articles of organization adopted by the American Railway Association May 19 differ from those proposed a year ago (see *Railroad Age Gazette*, June 26, 1908) quite materially. The committees are reorganized and simplified, as then proposed; but the two committees which would have made the most important changes in the association's work—that on traffic relations and that on legal and economic relations—have been dropped. The committee on accounting and statistical inquiry is also abandoned; but one is added on safe transportation of explosives. We summarize the principal changes.

The following clause added to article 4 puts in words what has heretofore been implied:

To be admitted to membership a road must be a common carrier dependent upon its revenue from transportation. Railways are ineligible to membership, whether incorporated or not, which are used primarily to transport the material or product of an industry or industries to and from a point on a railway which is a common carrier, or those which are merely adjuncts to such industries.

Article 5 has a provision that "No official of a member below the grade of a division superintendent shall cast a vote without written authority from the actual or present ranking operating officer of the member voting."

The secretary becomes "general secretary" and the treasurer's office is a separate office, but Mr. Allen continues to hold both. The terms of these, as well as of the president and vice-president, will be two years instead of one year. Article 7 provides for only two committees, the executive committee and the committee on nominations. The general secretary is the secretary of these two committees and also of the other committees, referred to later, but he, in connection with the chairman of a committee, may appoint a secretary of a committee. All committees must promptly and fully report to the general secretary.

The other changes in the articles of organization have to do with details. The articles of organization can be amended only by a four-fifths vote. Coming now to the by-laws, which can be amended by a two-thirds vote, the first section after that fixing dates for the meetings (third Wednesday of May and November) is that which provides for five committees, namely, on transportation, on maintenance, on relations between railways, on safe transportation of explosives, etc., and on electrical working. The last named has seven members, each of the others six members. Whenever from any cause a committee shall cease to have a quorum in its membership, the executive committee may make such appointments as may be necessary to fill the vacancies. The standing committees may be divided into divisions and a vice-chairman may be elected for each division. Each of the five committees just named may, with the approval of the association, appoint a chairman who need not be an officer of a railway company.

In adopting the revised Articles of Organization and By-laws the association resolved, "That all committees of the association not included in the list of standing committees as given in the revised by-laws be and are hereby discharged with the thanks of the association; this, however, not to affect the Committee on Relations with the Interstate Commerce Commission, appointed April 22, 1908." The Commission on Interchange of Freight Cars (the McCrea Commission) is not technically a committee of the association and is not affected by this action. To serve until the association elects the members of the new committees, the Executive Committee will soon appoint members to serve thereon and prescribe their terms of service.

In presenting the revised articles the Executive Committee explained its reasons for the more important changes, and especially for the dissolution of the Committees on Train Rules, on Car Service, on Safety Appliances, on Standard Box Cars, on Car Efficiency, on the Standard Cipher Code, on the Metric System, on Accounting and Statistical Inquiry, on the Standard Location of Third Rail Working Conductors and on Standard Rail and Wheel Sections. If the new committees prove insufficient for the work the association, at any time, can direct the appointment of other special committees.

The duties of the Committee on Relations with Traffic Organizations [proposed a year ago] are believed to be sufficiently covered by the duties assigned to the Committee on Relations between Railways. In place of the proposed Committee on Legal and Economic Relations the Executive Committee will obtain legal advice when necessary, and the General Secretary has been made the custodian of the nucleus of a library. The provision for the appointment of a chairman of a committee, who need not be an officer of a member of a company which is a member of the association, is in accord with the action of the association last November with respect to the chairman of the Committee on Car Service and the Committee on Car Efficiency. When a company has been elected a member of a committee the "Chief Executive Officer," in place of the "ranking operating officer," will become the individual member of the committee or shall select some other official for that purpose.

STUDENT EMPLOYEES ON THE HARRIMAN LINES.

One of the difficulties that the managements of all railways meet is that of getting young men with a broad enough knowledge of railway matters to put in line for promotion to official positions in the operating departments. For some years J. Kruttschnitt, Director of Maintenance and Operation of the Harriman lines, has been developing a plan for teaching possible officers in a practical way the fundamentals of the operating side of the railway business, and there are now young men scattered through the stations and offices of all grades of the operating department of these lines who, while doing work for which they are paid, are being instructed regarding numerous phases of railway operation. This "student work" is in general charge of F. G. Athearn, formerly of the University of California, who is the author of a curriculum having the title, "An Outline of Work and Reading for Students in Railroad Operations," which recently has been published by the Harriman lines.

Any man between the ages of 21 and 30 is eligible to appointment for a studentship. Other things being equal, preference is given, first, to college or technical school graduates in the employ of the company; second, to men with common school education in the employ of the company; third, to college or technical school graduates not in the employ of the company. Appointment to a studentship does not carry with it a promise or obligation on the part of the company to give the appointee an official position on the completion of the course; but one who has been graduated from the student class will be given preference in the filling of a vacancy if he is temperamentally fit to meet the requirements of the position, and there is now a considerable number of men in minor official places on these lines who have taken the student course.

The work of students is divided into six periods as follows: First period, six months, in station service; second period, nine months, in maintenance of way service under yard master and resident engineer; third period, six months, in master mechanic's office; fourth period, five months, in service with regular train crew as student brakeman and conductor; fifth period, two months, in signal engineer's office; sixth period, two months, in store department; seventh period, four months, in accounting department; eighth period, eight months, with trainmaster—a total of 42 months. The work of the several periods must be pursued in the order here indicated, unless special permission has been secured to deviate from it. Students in the main are treated just like other employees. They are subject at all times to the rules governing the particular work in which they are employed and must report to, and be subject to the discipline of the officer in charge of the department or division with which they are connected in the same way as other employees. Any infraction of the usual regulations which would cause the dismissal of any other employee will also cause the dismissal of a student. They are required to be on duty during the entire working time of the month, and all reading must be done on their own time.

The students are carried on the payroll, receiving the following wages: First and second periods, \$80 per month; third, fourth and fifth periods, \$85 per month; sixth and seventh periods, \$90 per month; eighth period, first four months, \$95 per month, and last four months, \$100 per month. They are allowed personal expense accounts where their duties are such as would carry an expense account for an ordinary employee.

There are now about 25 students in the employ of the various Harriman lines, and they include graduates of a large number of the leading technical schools of the United States. Upon the completion of a period, the head of the department or the superintendent of the division under whom the student has studied during this period, renders to the officer in charge of the work of instruction, a confidential report, giving his personal estimate of whether the young man is one who will

develop into an efficient railway officer. This estimate should be based on personal observation, and when this is not possible, on reports from subordinate officers.

Students are graded by officers under whom they serve as follows:

Grade 1 (Between 95 and 100 per cent.)—Very rare and exceptional ability.

Grade 2 (Between 85 and 95 per cent.)—Work, reports, application to duty, ability to learn and general effectiveness, very satisfactory.

Grade 3 (Between 75 and 85 per cent.)—Work, reports, application to duty, ability to learn and general effectiveness good, but could be improved without requiring "very rare and exceptional ability."

Grade 4 (75 per cent. and under)

A student receiving an average grade of 75 per cent. or less for any period is dropped. The reports show that most of them are doing good, and that many are doing really excellent work. Appointees who have had experience in railway work or who have had technical training which, in the opinion of their superior officers, covers the work outlined for one or more periods, are allowed credit on account of such experience and the course shortened accordingly.

Students must report in writing on the first day of each month to Mr. Athearn, the officer in charge of students. Their reports must be full and comprehensive reviews and criticisms of the work and reading done during the previous month. They are instructed not to hesitate to criticize adversely, to comment or to suggest improvements. They are told, however, that "it should be remembered that destructive criticism without the recommendation of something better, is nothing more than fault-finding, and as such accrues not to the benefit of the writer." They are graded on the basis of their monthly reports and of the accounts of them given by their superior officers, and in passing on their own reports grammar, phrasing and general literary construction are taken into consideration.

While the railway business is highly specialized, it is well known that the most successful railway men are those who know everything about some particular department and something about every department. The foregoing indicates, and the extended outline of the curriculum which is printed below shows still more clearly, that the object of the management is to teach the students something about every phase of railway operation, and thereby lay for them a broad foundation before they begin to specialize in some particular branch of the business.

Despite the excellent wages paid and the fine opportunities afforded, it has not been found easy to get enough of just the right kind of young men for studentships. This no doubt is mainly due to the fact that most young men rather shortsightedly prefer to get employment that, temporarily, is more remunerative, than to spend almost four years in work and study that will lay broad and deep the foundations for future success.

It is thought that the following abstract of the curriculum prepared by Mr. Athearn, with the aid of the officials of the Harriman Lines, for student work, may prove interesting to the officers of other roads that feel the need of some plan of better educating and training young men for official duties:

FIRST PERIOD—IN STATION SERVICE.

A

1. Receiving, trucking, marking and preparing freight for loading and unloading. 2. Loading and storing freight in cars; juxtaposition of different commodities. 3. Station order loading. 4. Handling of explosives. 5. Transferring of freight. 6. Checking of errors in loading and unloading. 7. Different systems of handling freight. 8. Cost of handling freight per ton, and how affected.

B

1. Placing cars for loading and unloading. Importance of proper arrangement. 2. Carloads and less than carload lots, with special attention to loading cars to maximum capacity and the assigning of cars in commercial switching of such capacity as to as nearly as possible fit the shipment offered. 3. Over and short shipments. How best avoided. 4. Sealing and seal records. 5. Routing, particularly of foreign cars. 6. Demurrage charges.

C

1. Accounts and statistics. Make a careful study of all forms and reports and why used. 2. Filing of correspondence. 3. Classification of freight and tariffs. Note the difference between the Western and the Official classification. These classifications should be studied with

the view to learning how to find and apply rates. 4. Way-bills and bills of lading. 5. Car records. 6. Loss and damage claims. 7. Per diem service rules. 8. Mail service. 9. Handling of train orders. (A general knowledge is all that is required at this time. Standard rules 201 to 223, inclusive, also 250 to 256, inclusive.) 10. Ticket sales. 11. Baggage and baggage records. 12. Soliciting business and representing company.

Reading in First Period.—"Yards and Terminals," Droege, chapters 16 and 19; "Economics of Railroad Operation," Byers, pages 513-536 and 194-209; "Railroad Organization and Working," Dewsnap, pages, 63-75, 113-126, 127-146, 433-440, 440-446, 447-458, 463-487; "American Railway Transportation," Johnson (read the entire book, giving special attention to chapters 9, 10, 12 and 19); "Railway Mail Service," Tunell; "Train rules, baggage rules, rules governing safe transportation of explosives"; "Standard Rules," 916 to 963, inclusive; make a careful study of Official Time Table.

SECOND PERIOD—IN MAINTENANCE OF WAY SERVICE.

A

1. Roadbed, width, cuts and fills, subgrade, ditches; method of forming embankments, culverts, drainage, destruction of weeds, fencing. 2. Ballast, purpose, requirements, kinds of ballast and relative values; methods of laying, cost per cubic yard and how affected. 3. Surfacing, purpose, importance of not raising general level of track in surfacing; causes of center-binding and springy track; how avoided. 4. Ties, kinds; relative cost and durability; regulations for and methods of laying. 5. Tie-renewals, importance of this item and best method of determining when renewals should be made; cost. 6. Tie-preservation, methods of treating, cost of different methods, comparison of treated and untreated ties as to cost and durability. 7. Rails, weight to be used and how determined; rail wear, on curves, on tangents; creeping; rail-renewal, most effective organization of gang for this work; use of discarded rail; use of rail removed from main line for side tracks; transferring inner and outer rail on curves. 8. Joints and joint fastenings; relative merits of supported and suspended joints; comparative advantage of angle bars, 100 per cent., Bonzano, Weber and continuous joints of various patterns; theoretical requirements for a perfect joint; causes of rail joint failures; tamping of joints. 9. Switches and frogs, split switch, Wharton switch, stub switch, elements of safety and danger in each; derailing switch and its uses; rules for laying switches. Frogs; give careful attention to the various designs for frogs, such as the spring-rail, stiff frog and sliding-wing frog. 10. Tie-plates, advantages and different designs; merits of each. 11. Track implements, proper care and record of same. 12. Buildings, bridges, track on bridges, trestles. 13. Wrecking and emergency work, protection of trains, patrolling of dangerous track, assembling material, organization of gangs, reports and records. 14. Compensation of grades, curvatures, taper curves, super-elevations.

B

Division Engineer's Office: Handling of material, distribution of forces, examination and study of reports, estimates for repairs and new work, accounts and records.

C

Students will spend not less than two months in actual charge of a section gang, assume all responsibility ordinarily devolving upon a section foreman and keep all records in connection therewith.

Reading in Second Period.—"Economics of Railway Operation," Byers, chapter 2, part 5; "Elements of Railroad Engineering," Raymond; "Railroad Construction," Webb, chapters 1 to 12, inclusive; "Railway Organization and Working," Dewsnap, pages 160-174; "Notes on Track," Camp; "Manual of Recommended Practice for Railway Engineers and Maintenance of Way"; "Economics of Railroad Construction," Webb, chapter 9; "Elements of Railroad Engineering," Raymond, chapters 1 to 9, inclusive.

THIRD PERIOD—IN MASTER MECHANICS' OFFICE.

A

1. Preparation and care of passenger cars. 2. Preparation and care of freight cars. 3. Car inspection, importance from standpoints of economy and safety, and with special attention to the relation of inspection to cost of repairs. 4. Rough handling and how best prevented. 5. Classification and construction of freight cars.

B

1. Engines—Types and how classified. 2. Difference in design of various types of engines. 3. Purpose of different designs. 4. Repairs—Principal item in cost of repairs, cost per engine-mile. 5. Total cost of operating an engine per engine-mile. Elements which go to make up this cost and how affected. 6. Flange lubrication and results derived. 7. Fuel, elements which determine the value of any given fuel; comparison of coal and oil. 8. Proper and improper use of fuel in firing and effect upon cost of repairs per engine-mile. 9. Water, importance of good water. What constitutes good water. 10. Effect of poor water on cost of operation and repairs. 11. Methods of treating and economic results. 12. Pumping plants.

C

1. Shops and roundhouses. 2. Organization of shop forces. 3. Distribution of labor. 4. Sources of expensive shop operations. 5. Distribution and care of supplies. 6. Importance of accurate checking of issues of supplies to engines other than water and fuel. 7. Careful study of the air brake. 8. Engine failures, causes and remedies. 9. Clerical organization. 10. Reports, statistics and accounts. 11. Ton-

nage rating. 12. Effect of grades and curves on engine mileage and application of these factors to local tonnage rating.

Reading in Third Period.—"New Catechism of the Steam Engine," Hawkins; "How to Run Engines and Boilers," Watson; "Elements of Railroad Engineering," Raymond, chapters 11, 12 and 13; "Economics of Railroad Operation," Byers, chapter 3, part 5, and pages 492-513; "Railway Organization and Working," Dewsnap, pages 212-263; "Economics of Railroad Construction," Webb, chapter 7; "Railroad Construction," Webb, chapters 15 and 16; *Railroad Age Gazette*, Jan. 15, 1909, page 119; Official Proceedings of Pittsburgh Railway Club, January, 1908, page 94; Standard Air brake Rules; Locomotive Data, Baldwin Locomotive Works.

FOURTH PERIOD—STUDENT BRAKEMAN AND CONDUCTOR, WITH REGULAR CREW.

A

1. Train signals. 2. Protection of trains. 3. Coupling and uncoupling, with attention to prevention of personal injuries. 4. Switching, with attention to prevention of personal injuries. 5. Handling cars, importance of careful handling. 6. Advantageous placing of cars in train. 7. Careful study of air brake machinery and structure of cars.

B

1. Way-freight work. 2. Handling of bills. 3. Conductor's records and reports. 4. Handling of train orders (to be studied from conductor's point of view). 5. Action in case of accidents.

Reading in Fourth Period.—Standard Book of Rules; Current Time Table; "Economics of Railroad Construction," Webb, chapters 5, 10, 11 and 12; "Economics of Railway Operation," Byers, chapter 4, part 5; "Railway Organization and Working," Dewsnap, pages 243-263; "Air Brake Catechism," Blackall; "American Railway Transportation," Johnson, chapters 9 and 10.

FIFTH PERIOD—IN SIGNAL ENGINEER'S OFFICE.

1. Manual block signals, staff system, telegraph system permissive, absolute. 2. Automatic block signals. 3. Interlocking plants, mechanical, electro-pneumatic, hydro-pneumatic, all air, all electric. 4. On single track; on double track. 5. Protection of crossings. 6. Mechanism, maintenance, installation. 7. Cost of maintenance, accounts and records.

Reading in Fifth Period.—"Elements of Railroad Engineering," Raymond, chapter 10; "Railroad Construction," Webb, chapter 14; "The Block System," Adams; "Railway Organization and Working," Dewsnap, pages 160-211; standard Book of Rules; for definitions and illustrations, see Signal Dictionary, 1908 edition.

SIXTH PERIOD—IN STORE DEPARTMENT.

1. Careful study of uses, value and proper care of company material. This information to be gained as helper to section storekeeper in general store. 2. Handling of requisitions; necessary approvals; from what data prepared; method by which stock is made available quickly. 3. Pricing; distribution of charges to various accounts; analysis and purpose of statements in connection with Stores Department.

Reading in Sixth Period.—"Railway Organization and Working," Dewsnap, pages 141-159; "Elements of Railroad Engineering," Raymond, pages 1-16; "Economics of Railroad Construction," Webb, chapters 1 to 5, inclusive; "Economics of Railway Operation," Byers, chapter 6, part 5.

SEVENTH PERIOD—IN ACCOUNTING DEPARTMENT.

1. Daily report of movement of trains. 2. Statement of gross and net tons hauled in freight and mixed trains. 3. Locomotive performance in freight service. 4. Statistics of freight train service. 5. Statistics of passenger train service. 6. Operating statistics by divisions. 7. Operating of important freight stations. 8. Statistics of maintenance of way and structures. 10. Railroad organization.

Reading in Seventh Period.—"Economics of Railway Operation," Byers, parts 1, 2, 3 and 4; "Railway Organization and Working," Dewsnap, pages 1-36, 44-62, 141-146, 264-384; "Elements of Railroad Engineering," Raymond, pages 1-16; "Economics of Railroad Construction," Webb, chapters 1, 2, 3, 5 and 6; "American Railway Transportation," Johnson, chapters 5, 6, 7, 8, 13, 14, 25, 26, 27, 28 and 29; "The Railway Auditor," Whitehead; "Anatomy of a Railroad Report and Ton-Mile Cost," Woodlock; accounting system required by Interstate Commerce Commission.

EIGHTH PERIOD—WITH TRAINMASTER.

A—With Yardmaster.

1. Make-up of yard; purposes and uses of several groups of tracks. 2. Switching. 3. Weighing. 4. Make-up of trains: First, as to safety; second, as to destination; third, as to contents. 5. Necessity for care in handling cars. 6. Causes of unnecessary switching, and how avoided. 7. Loading of engine to full tonnage rating. 8. Special attention to methods of clearing blockades. 9. Yardmaster's records. 10. Yard expenses per freight car handled; how affected.

B—With Despatcher

1. Systems of despatching: Double order, telephone, A. B. C., and staff system, and relative merits of each. 2. Different forms of train orders and their uses. 3. Handling trains, importance of economy of time in making meets. 4. Importance of familiarity with length of sidings, grades, etc. 5. Knowledge of capacity of engines. Effect of train resistance. 6. Chief causes of delays, and various methods of overcoming same. 7. Work on time table charts. 8. Balancing of traffic. 9. Despatcher's records and reports.

C—With Trainmaster.

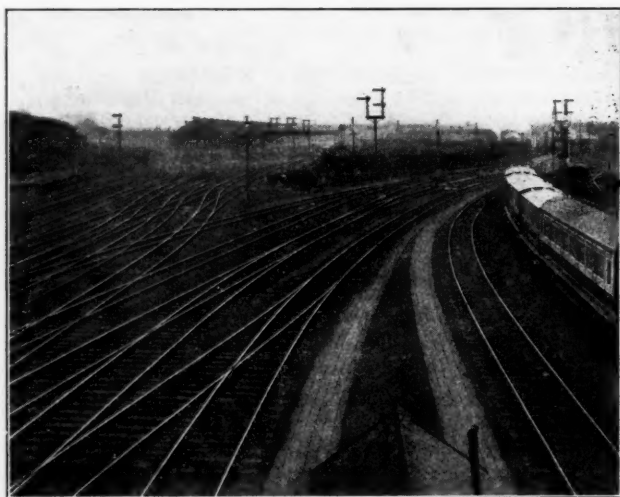
1. Expedition of car movements, and distribution. 2. Handling of fast and slow freight, with reference to necessity and competition. 3. Full loading of cars and engines. 4. Education of station agents in the matter of full loading of cars, prevention of delays, maintenance of neat yards and stations. 5. Cutting down of overtime. How best accomplished. 6. Balancing of way-work between crews. 7. Investigation of delays. 8. Enforcing operating rules. 9. Wrecking work. 10. Carrying out of the division's policy. 11. Disciplining of employees.

Reading in Eighth Period.—"Standard Book of Rules," in its entirety; all wage schedules and agreements between company and employees; "Yard and Yard Terminals," Droege; "Elements of Railroad Engineering," Raymond, all portions relative to economics of railway operation not previously assigned; "Economics of Railroad Construction," Webb, all portions relative to economics of railway operation not previously assigned; "Economics of Railway Operation," Byers, all portions not previously assigned; "Railway Organization and Working," Dewsnup, all portions not previously assigned; "American Railway Transportation," Johnson, all portions not previously assigned; "Letters of an Old Railroad Official to His Son, a Division Superintendent," Hine.

INTERLOCKING IN EUROPE.*

The protection of switches on most European railways is much more complete than in America, as practically all main-track switches are interlocked with fixed signals. By far the greater proportion of the interlocking is mechanical, though both in Great Britain and on the Continent power interlocking has come prominently to the front in the last few years, not, by any means, however, to so great an extent as it has in America. In Europe there is a marked tendency to use mechanical interlocking machines at much larger plants than would be mechanically interlocked on American roads. The mechanical interlocking used in the United States is of British origin, but appears to have developed faster in improvement of details than has the English practice.

Notable features of British mechanical interlocking machines are the small amount of preliminary latch locking used and the heavy and substantial construction of the locking bars and tappets. Some British signal engineers claim that there is no advantage in preliminary latch locking, but to the



Junction at South Box, Crewe; London & North Western.

American observer it would appear that the reason it is not used is principally because many of the machines are so large and the locking bars so long and so heavy that it would be exceedingly difficult for a signalman to operate a lever latch which was provided with a latch spring sufficiently powerful to drive the locking bars.

Almost all distant signals are operated with a single connection, a small galvanized stranded cable being used. The night indication of the distant signal in the caution position is identical with the night indication of the home signal in the stop position, namely, a single red light. In a number of other respects

*From report of Ames and Adams, Interstate Commerce Commission, January, 1909.

the indications differ from those used in America, particularly as regards the indications for route signaling. The practice in this respect in Great Britain and to a considerable extent on the continent is to display each signal arm denoting a diverging route upon a separate post rather than to display the arms one above the other on the same post. The Belgian State Railways formerly used the American method for indicating diverging routes, but have recently changed from the one-pole, two-arm type to the English practice, using a separate post or doll for each track, mounted upon a bracket mast or, as the French and Belgians call it, a "chandelier" or candlestick.

"Calling-on" arms are frequently employed to permit switch-



A Bit of American Scenery in England; Automatic Block Signals on London & South Western.

ing movements to be made past a signal at the entrance of a section of track which is not clear.

On the Belgian State Railways the proceed indication is given by the upward inclination of the semaphore arm. On the Northern Railway of France distant block signals are in the form of a circular disk; home block signals are semaphores of the skeleton type with enlarged rounded ends; distant signals for interlocking plants are square or lozenge-shaped metal banners, the former being used when the signal is located 800 meters or more from the home signal, and the latter form when on account of view or other conditions it is necessary to locate the distant signal at a less distance from the home; and the home interlocking signals are in the form of a square. Disk and square banners have the disadvantage that in the proceed position they are turned edgewise to an approaching train, the proceed indication being given simply by the absence of the caution or stop indication. On this railway diverging routes are signaled by pointed or fishtail arms in addition to the square banner home signal.

Lattice cantilever brackets are frequently used to support home signals in such a manner as to bring them over the tracks to which they refer. Very large wire compensators, mounted in heavy cast-iron frames, are placed at the middle point of most distant signal wire lines, the distant signal being operated by a single stranded cable. These compensators are used for distances as great as 2 miles.

Both inside and outside detector bars are in use. Some roads are using solid rods for cross leads instead of pipe, and a few roads use channel-iron sections for switch lock and signal connections instead of pipe. At least one road in Great Britain uses separate facing point locks for each point of a pair of switch points.

In power interlocking little advance is being made in Great Britain along electrical lines, with the exception of a few isolated examples of electric systems. The only type in extensive use is the Crewe system on the London & North Western. This system of power electric interlocking was designed by officers of the road, and the apparatus is all manufactured, as is all signaling and interlocking apparatus used on this road, in its own shops. The system is relatively simple and rugged in construction. Current is supplied at about 230 volts potential. The switch motors take about two amperes in starting light and about ten when carrying the full load of the switch points. The signals, which are of the solenoid type, require about three amperes for clearing and hold clear on one-half ampere. At Crewe Station, which is an important and complicated junction, single-arm semaphore signals are used for the diverging routes, provided with a route indicator in the shape of a stationary rectangular board constructed on the principle of slatted signs to display a very large letter to indicate the route, such as M for Manchester, H, Holyhead, etc.

The tappet locking of these machines is arranged in two and even three banks, the tappets being crank driven from vertical rods operated from miniature levers of the mechanical interlocking machine type arranged one above the other. These rods also operate heavy carbon contact blocks for the control of the circuits operating the various functions, and are in turn controlled by indication latches of the hook form having horizontal magnets. All parts of the switch machines except the motors run in oil. Battery indication is used and there are no considerable refinements of circuits or protective devices for cross and ground protection, at least not to anything like the same extent as in America.

A considerable number of low pressure pneumatic interlocking machines have been installed in Great Britain and a



One-Arm Route-Signal and Indicator at Crewe.

number on the continent, and in some of the installations, notably on the Northern Railway of France, route levers rather than function levers have been used; that is, instead of having a lever for each switch or crossover, and a lever for each signal, one lever is provided for each route through the plant, the apparatus being so arranged that when the lever for a given route is reversed the various switches in that route will be successively set, locked, and indicated, the proper signal clearing upon the return of the last indication, denoting the complete setting up and locking of the route.

Two notable installations of power interlocking in Great Britain are the electro-pneumatic plants recently installed at

Newcastle-on-Tyne for the Northeastern Railway, the south box of this station containing 211 levers, and the new plant at the Glasgow Central Station on the Caledonian Railway, which, so far as known, is the largest power interlocking machine in the world. It contains 374 spaces.

At the Newcastle plant selection is freely used, as on machines of this type in the United States. There appears to be a considerable difference of opinion among British signal officers as to the use of this expedient. In the Newcastle installation the track circuit is used extensively for operating an illuminated track diagram or indicator to denote the presence of trains on the various track sections. It is to be noted that these track circuits control visual indications only and are not used for the control of electric locks on the interlocking machine levers.

A new electric interlocking system is being developed by Mr. Arthur H. Johnson, signal and telegraph superintendent of the London & South Western, in which an electric motor drives a rotary paddle in oil to force the oil into a cylinder, the piston of which operates a lock and switch movement. The return indication in this system is of the alternating current type, in which a small A. C. motor is provided for each lever. This drives a ball governor of ingenious design for tripping the indication latch.

A novel piece of apparatus is an electric signal repeater, chiefly used for fog-signaling purposes, designed by Mr. Johnson. The magnets, and in fact all working parts of this repeater, are mounted in a glass bath which is filled with refined petroleum, affording additional insulation protection as well as prevailing rust. The glass being of good quality and the miniature semaphore arm of the repeater being placed quite close to the glass, the visibility of the indication is not at all impaired by the immersion in oil. This repeater is used at Waterloo Station, London, one mounted in a wooden box at each fogman's station. The cover of the box operates a switch so that current from the battery is not thrown on to the apparatus until the cover of the box is opened.

IDLE THOUGHTS OF AN IDLE CAR.

BY O. C. CASTLE.

It is pretty dull for a fellow of my roving nature and energetic disposition to be chucked off here with a lot of other cars classed as "surplus," with nothing better to do than to swap yarns with my companions or reflect on the disappointments which life holds for us all. It seems to me but yesterday that I was a fine new car, just out of the shop, glistening with fresh paint and eager to forge to the front in the battle of commerce. What a superior air I assumed as I mingled with the scarred veterans which I encountered after reaching the yards in the outside world. How I sneered as they told of the averages produced by them in their yearly performances.

Twenty-five miles per day—Pooh! Twenty tons per load—Tush! In my journey from the big shop where I was built to the yard of my home road I had rolled along at the rate of 200 miles a day, and I thought I knew something about what a freight car ought to do. True, I had not as yet handled any loads, but did I not have in plain stencilling on my sides a capacity almost double the amount my companions seemed to think a fair average load?

The older fellows seemed only amused at my egotism, and exchanged knowing winks and nudges which quite nettled me. But in spite of their ridicule (which I attributed to jealousy), I secretly resolved that I, for one, would pitch in with a will and would do my very best to redeem the reputation which seemed to attach to the freight car, as a general proposition—as a reporter would say.

While I was still chafing under the delay which hindered me from putting my resolution into effect, a young man came out of a little shed, and walking down the track on which we stood, marked something in white chalk on each

car. Soon after, a little yard engine came puffing down, and grabbing me and several of my fellows, jerked us away to another siding quite a distance from the main yard, placing us alongside a high building with no windows in it that I could see. While I was wondering what I was there for, a man came along and placed a long spout in my door. Soon a lot of little yellow kernels began to run through the spout, and with the warm pressure of the grain against my sides, I realized that I was at last a cog in the great wheel of transportation, and I swelled with pride in my own importance.

When I was filled a card was tacked to my door, and with my fellows I was shifted back to the main yard where we were placed on a track with a lot of other cars, some belonging to our family and some to others, but all filled with grain, the same as we were.

After a time we were made up into a train, and moving out of the yard were soon bowling along at the rate of twenty miles an hour. I could scarcely refrain from taunting the lazy fellows who had been laughing at me only a few hours before; but I decided to wait until I had a more favorable opportunity.

In the course of four or five days we arrived at our journey's end, which was in a yard bordering on a large body of water. At this point we were shifted onto a track alongside another tall windowless building, where I was soon relieved of my load and switched back into the main yard.

The next day I was set in on the "house track," which ran in under a big shed where there was a platform on which were piles and piles of boxes, barrels and all sorts of packages. The track was filled with cars, and there were a great many men going up and down the platform with hand trucks, stowing the packages, some into one car and some into another.

Towards evening, although few of us were more than half filled, our doors were closed and sealed and we were taken out into the yard. I thought we would be taken back in the morning and our loading completed, but instead we were made up into trains and started out on the road. In a chat with the fellows nearest to me in the train, I learned that they were all going to different stations, and that each had all the freight there was for his particular destination, which accounted for the light loading we had all been given.

I traveled all that night and the next day, and late in the following night arrived at my destination, where I was pushed into another big shed. In the morning I was unloaded promptly, again partially filled with boxes and started on my way. Along about midnight, while we were moving swiftly along and I was wondering what service I would next be called upon to perform, I suddenly felt my brakes tighten, the fellow ahead of me jerked violently forward, then stopped, while those behind pushed me forcibly against him. There was a loud crash all around me, I felt a crunching throughout my body, a twisting of my running gear, and turning over on my side I came to an abrupt stop up against the embankment.

Soon there were lanterns moving down the track toward us; the trainmen gathered around talking excitedly. Then the rest of the cars were cut off and pulled away, leaving three of us lying all bunched together, like dead horses, with our wheels and brake rigging hopelessly twisted and tangled.

I had been terribly frightened at the accident, and at this seeming desertion I was well-nigh frantic, but the fellow ahead of me, who was a seasoned stager, assured me that they had only gone to get the wrecker and would be back soon to rescue us. Sure enough, they returned after a while, with an immense derrick, and a couple of hours' work by torchlight saw us relieved of our loading, placed on our trucks and started off toward the division repair shop, where we were jammed in on a track with a lot of other cripples.

I could see them repairing cars every day, but it seemed an age before they got around to me, and I was quite impatient at the delay. Finally, however, I was repaired and moved out into the yard and in due time was again in active

service, running up and down the country, handling all sorts of freight from and to all sorts of places.

This kept up for some time, and when I had begun to feel that life was somewhat monotonous after all, I came one day to a big yard where there seemed to be an unusually large number of cars. I was quite gratified to find that the car next to me was one of my own family. I had not met any of them since last leaving home, and you may be sure I was glad to strike up a conversation with this chap. I had been on and off our home road several times in the past few weeks, and was quite surprised when he told me he had not been home for five months. He said he had not been lonesome, as he frequently met cars of our family, but he complained that he was getting in bad shape physically, on account of the indifferent care he received when away from home. As he spoke he glanced at a patch which had been bunglingly placed on his side and painted quite a different color from the rest of his body. I also noticed that his shoes were considerably worn and his roof was in need of repair.

While we were talking a couple of men passed down the track looking over the cars. One of them said he was short some "Southern route" cars, and I thought we would surely be taken out and given a load. My brother dashed my hopes, however, by informing me that we were "Western route," and could not be used.

This question of routing was one that had puzzled me a great deal, and I took advantage of the opportunity to enquire regarding it. My brother was not a little surprised at my ignorance, but informed me that it was against the rules to load cars except to or over their home roads. This rule, as I knew by experience, was but little observed when cars were badly needed, but it seemed that just now cars were becoming a little more plentiful, and consequently the rule was being more strictly lived up to.

I thought it rather odd that there should be a rule which was effective under one condition, but not enforceable when conditions were reversed, especially as it worked such hardship to us poor cars and our owners. It looked to me as though our owners were not able to get hold of us when they had use for us, but as soon as we were not needed we were chased back home.

Our conversation was interrupted by the shifter which came to take me over to a private siding, where some men began to load me with hay; but when I was about half loaded they went away, and I was allowed to stand for several days. At the end of a week, however, the loading was resumed, and I was again en route.

On arrival at my destination I was shifted out to one side of the yard and a card reading "Hold for Reconsignment" was tacked to my side. This was a new experience for me, and I did not exactly understand it, but supposed it meant that I would soon be traveling again. However, I was not moved for several days, and was then merely switched through the terminal and placed on a siding with a lot of other cars. Some of the fellows there told me they had been standing on the siding for a week or more. There were a few teams engaged in unloading the cars, but they didn't seem to be making much progress, and no one started to unload me until after several parties of men had come and looked over my lading; but after I had been there five or six days I was finally released.

I had noticed that a good many of the cars were immediately reloaded, but when it came my turn, I was shifted out and placed in the big yard. Since business had begun to fall off I had become accustomed to being passed in the loading when there was no freight for my home line, but in this case I saw the car next to me, which belonged to the road I was then on, given a load for my own home. I wanted to volunteer to handle it myself, but before I had an opportunity to do so I was whisked away and put in a train with a lot of other empties and started out on the road. I could not under-

stand why we were not given the loads for our own homes, but one fellow who was better posted than the rest of us said there were plenty of empty cars and that the owner of the road wanted to get his own cars in service so that they could earn their expenses.

My return home was somewhat delayed by the refusal of one road to handle me, claiming that I had not traveled that route on my original movement away from home. One of my fellows remarked that there must be something wrong, as he was quite sure he had been accepted by that road under the same routing conditions, but added that it was at a time when cars were in demand. The result of this holdup was that I had to go home in a round-about way which greatly increased my mileage. I certainly had no cause to complain about the speed at which I was moved, as it was much faster than I was used to traveling when under load, but as I was empty I could not see that my activity was particularly productive, and I was sure that the movement must be quite expensive to some one.

I worried a good bit about all this empty travel, but consoled myself with the thought that my owner would probably adopt the same tactics as the road I had been on, and I should be given a load for some foreign line as soon as I reached home. My surmise proved correct, as I was immediately loaded to a distant point on another road, although I could see cars of that road going home empty. I could not help feeling that this was wrong, and was especially sorry for the poor fellows who were placed in the position I had so recently occupied.

However, there was a surprise in store for me. When I arrived at the point of junction with the line to which I was to be delivered I found that my lading was to be transferred. I had been through that experience once before when there was something wrong with one of my sills, and I didn't like it at all. I remembered that I had lost two days waiting for the transfer, and had then been moved back empty to the shop, where I was further delayed. I had also heard the freight complaining at the rough manner in which it was handled during the transfer, and I felt sure that it was not a good thing to do unless there was no way to avoid it. There was nothing the matter with me now, and the only reason I could see for the transfer was that the road to which my lading was consigned had plenty of its own cars to handle the freight in, and did not want to pay the small amount my owners charged for me.

After being relieved of my load I was allowed to stand around for several days, but was finally coupled on to a string of other empties and moved over here to this storage track. On another track close by there were several cars marked "shop," but I could see no repairmen anywhere around. While I congratulated myself on not being in the shop bunch I felt pretty blue at being side-tracked with no definite idea as to when I should be restored to service.

But after all, "What's the use?" I suppose I might as well take it easy while I have the chance. It seems that no matter how hard I try I can't get more than just a certain amount done. I am sure that if I were allowed to go my own gait, and not have to be guided by a lot of rules that I can't understand, I could do lots better. I don't see why a fellow has to stick so close to home, or always have his folks making a fuss about him when he is away. I suppose my parents feel a personal interest in me, and like to have me around, but I've been battered to and fro so much that I've really become quite weaned away from my legal family. Besides I've noticed that they are not nearly so particular about me individually, when they have other cars to do my work, and they seem actually indifferent to my welfare when there is what they call a "surplus" of cars.

I've often talked with my fellows about these troubles and they all seem to think it would be better if we were all one family and could help each other. No, not quite all of them either, for there are a few big aristocratic chaps who seem to

think themselves too good for common service; but I notice they don't fare much better than the rest of us when they get away from home.

Of course, we are just poor ignorant freight cars, and can hardly be expected to possess the wisdom of those who direct our destinies, nor to appreciate the difficulties in the way of reconciling such widely divergent principles as Individualism and Communism. But then, some of the shippers, the same people who have so often delayed me by failure to load or unload me promptly, seem provoked at the conditions imposed on the use of the cars which come to their sidings. Many a time I have been almost ashamed of the beautiful decoration which designates my family connection, because it was displeasing to a shipper who wanted a car of another family. Indeed, quite often shippers would utterly disregard my family name and, to avoid the delay caused by shifting me out and waiting for the proper car to be placed on their siding, would use me for a shipment to any road or in any direction. In such cases there would be a lot of argument, and sometimes I would be delayed several days before being allowed to go forward. In fact, quite often I have been taken back in disgrace and compelled to give up my load to another car. This distinction between cars of different lettering not only hurt my feelings, but frequently resulted in injury to my anatomy through the excessive battering I received by the yard engines compelled to pick out particular cars for particular destinations.

Once I heard an irate shipper say that such illogical methods as were pursued by my owner and other car owners, and such utter indifference on their part to their own interests and those of the public, would encourage regulative legislation which might put in force rules more difficult of operation than those which could and should be devised by the car owners themselves. Of course a shipper must look at this from his own viewpoint, and I suppose it is rank heresy for me to repeat such radical doctrine even under my breath. But I hope I'll get out of here soon. I've done too much thinking for a poor brainless box car, and the hot sun on my roof makes my head ache.

The other day I picked up a piece of chalk which an inspector had dropped, and while I have been loafing I figured up what I did during the past year.

I find that I traveled 7,980 miles, an average of 22 miles for every day in the year. Of this mileage 5,466 miles were under load and 2,514 empty. I hauled 467 tons of freight, moving each ton a distance of 241 miles, which is equivalent to handling one ton a total distance of 112,599 miles. To accomplish this I had to handle 20.6 tons over each mile I traveled under load. During the year I contributed \$772 toward the gross freight revenue of the roads using me, which is an average of \$2.11 for each day. I was at home 249 days in the year, and away from home 117 days. The time I spent in the shop totalled 26 days, and I lay idle for 55 days, making 81 days out of the 366 during which I was out of active service. You will see that I made exactly the same record as was made last year by the well-known "average car," about which Mr. Hale has so much to say.

To be sure this doesn't seem like much of a performance, and I'll admit I was quite disappointed at some of the figures, but in view of what I've been up against I guess that the deficiencies in my record can hardly be charged to any negligence or lack of effort on my part.

Oh, dear. I thought I was lucky to be out of the shop class, but while I have been standing here some one came along and stole all the brasses out of my journal boxes and cut the rubber hose off my train line, and a careless yard engine in pushing some more cars in on the storage track jammed my drawbar back under the end sill. Now, I suppose when they do want me I'll not be in condition for work without a course on the "rip" track.

COMPARATIVE SUMMARY OF FREIGHT CARS IN SERVICE ON RAILWAYS OF THE UNITED STATES—1900 AND 1907.

(NOTE.—Narrow-gage cars excluded. Non-revenue cars excluded. Company freight included.)

	Miles.		Freight equipment.		In-crease.	Per cent. of ch'ge.	Freight cars per mile of road.		Average length of haul.		Freight cars per 1,000 freight-car revenue-ton miles.		Rate, per ton-mile, (dollars).		Fr't cars per \$1,000 freight earnings.	
	1900.	1907.	1900.	1907.			1900.	1907.	1900.	1907.	1900.	1907.	1900.	1907.	1900.	1907.
New England Roads.																
Boston & Maine	1,787	2,288	12,230	20,376	8,146	66.6	6.8	8.8	66.99	98.74	.126	.098	.0146	.0088	.01440	.01097
Central Vermont	513	536	2,006	2,983	977	48.7	3.9	5.5	94.97	79.28	.063	.105	.0079	.0113	.00880	.00947
Maine Central	816	845	3,586	7,174	3,588	100.0	4.4	8.4	81.11	88.56	.163	.167	.0123	.0146	.01130	.01018
N. Y., N. H. & Hartford.	2,008	2,060	13,116	19,776	6,660	50.8	6.5	9.6	85.36	90.20	.076	.098	.0097	.0102	.01451	.01472
Total	5,124	5,729	30,938	50,309	19,371	62.6	6.0	8.8	82.11	89.19	.107	.117	.0112	.0112	.01225	.01134
Trunk Line Roads.																
Baltimore & Ohio	3,199	4,006	61,708	78,073	16,365	26.5	19.3	19.5	194.81	193.85	.128	.104	.0068	.0068	.00412	.00570
Buff., Roch. & Pitts...	472	569	8,858	13,508	4,650	52.5	18.7	23.7	136.16	145.70	.139	.177	.0097	.0097	.00470	.00498
Central of New Jersey.	639	610	15,002	21,537	6,535	43.6	23.4	35.2	77.88	75.27	.153	.160	.0118	.0102	.00871	.00840
Chesapeake & Ohio	1,476	1,827	17,270	30,535	13,265	76.8	21.6	16.7	302.00	274.00	.082	.119	.0058	.0066	.00343	.00432
Delaware & Hudson	665	845	13,030	21,458	8,428	64.7	19.6	25.4	94.46	121.70	.147	.151	.0113	.0085	.00789	.00663
Del., Lack. & Western..	947	958	27,287	27,441	154	0.6	28.8	28.7	151.00	175.00	....	.109	.0144	.0078	.00808	.00765
Erle	2,104	2,151	46,225	51,514	5,289	11.4	21.9	23.9	191.40	160.22	.101	.115	.0089	.0083	.00559	.00614
Lehigh Valley	1,382	1,440	34,954	41,431	6,477	18.5	25.3	28.8	188.08	169.43	.135	.130	.0106	.0087	.00542	.00631
N. Y. C. & H. R.	2,817	3,782	59,180	66,012	6,832	11.5	21.1	17.4	163.00	195.00	....	.081	.0088	.0061	.00560	.00624
Pennsylvania	3,716	3,903	80,385	128,024	47,639	59.3	21.6	32.9	109.54	162.33	.091	.102	.0067	.0059	.00540	.00527
Reading	1,000	1,000	31,824	40,970	9,146	28.7	31.8	40.9	89.42	90.90	.139	.141	.0114	.0087	.00831	.00748
Western Maryland	279	540	691	6,224	5,533	800.7	2.5	11.5	51.02	95.24	....	.099	.0038	.0096	.00734	.00678
Total	18,696	21,630	396,414	526,727	130,313	32.9	21.2	24.3	145.73	154.89	.093	.124	.0092	.0081	.00622	.00637
Southern Classification.																
Atlantic Coast Line....	1,759	4,361	5,378	22,724	17,346	322.5	3.6	5.2	121.90	147.66	....	.126	.0143	.0152	.01401	.01235
Central of Georgia....	1,196	1,899	5,041	10,218	5,177	102.7	4.2	5.4	148.86	149.76	.107	.137	.0183	.0106	.01096	.00853
Louisville & Nashville..	3,007	4,343	23,402	39,528	16,126	68.9	7.7	9.1	163.00	168.45	.096	.116	.0090	.0090	.00758	.00801
Mobile & Ohio	876	926	5,389	10,091	4,702	87.3	6.2	10.9	195.63	244.65	....	.106	.0076	.0077	.00590	.00620
Nash., Chat. & St. Louis	1,189	1,230	5,328	9,080	3,752	70.4	4.4	7.4	151.00	170.43	.113	.373	.0096	.0090	.00880	.00887
Norfolk & Western.....	1,551	1,876	18,656	36,910	18,254	97.8	12.0	19.7	253.41	260.24	.085	.116	.0068	.0074	.00430	.00523
Seaboard Air Line (1901)	2,604	2,611	8,335	12,210	3,875	46.5	3.2	4.7	153.32	159.25	.119	.121	.0136	.0119	.01180	.01118
Southern	6,306	7,547	26,814	55,409	28,595	106.6	4.2	7.3	168.82	165.25	.107	.164	.0116	.0124	.00916	.00834
Total	18,488	24,793	98,343	196,170	97,827	99.5	5.3	7.9	169.49	183.21	.105	.157	.0114	.0104	.00906	.00859
Central Classification.																
Chic., Ind. & Louisville.	546	600	5,440	5,428	*12	0.2	9.9	9.0	153.00	153.00	.155	.134	.0141	.0105	.00757	.00810
Cin., Ham. & Dayton...	652	1,038	7,838	13,461	5,623	71.7	12.0	13.0	108.96	115.85	....	.201	.0122	.0125	.00610	.00590
C. C. C. & St. Louis...	1,891	1,983	15,484	23,189	7,705	49.8	8.2	11.9	169.30	153.20	.094	.107	.0083	.0073	.00583	.00572
Grand Rapids & Indiana	582	582	3,015	3,232	217	7.2	5.2	5.5	90.12	102.77	.140	.099	.0156	.0068	.00870	.00680
Lake Erie & Western...	725	886	5,549	4,916	*633	11.4	7.6	5.5	153.51	130.22	.137	.116	.0110	.0083	.00614	.00702
Lake Shore & Mich. So..	1,411	1,520	19,958	35,389	15,431	77.3	14.1	23.2	178.00	159.80	.067	.091	.0055	.0058	.00505	.00533
Michigan Central	1,635	1,746	14,219	18,890	4,671	32.8	8.6	10.8	193.50	170.00	....	.073	.0070	.0059	.00592	.00641
N. Y., Chic. & St. Louis	513	523	6,743	10,576	3,833	56.8	13.1	20.2	297.00	224.00	.059	.079	.0055	.0062	.00478	.00511
Pennsylvania Co.	1,396	1,414	43,967	52,844	8,877	20.2	31.5	37.4	77.95	75.32	.177	.143	.0135	.0078	.00590	.00600
P. C. C. & St. Louis....	1,407	1,472	12,884	22,910	10,026	77.8	9.1	15.6	111.14	99.95	.056	.072	.0052	.0053	.00620	.00630
Pere Marquette	1,821	2,298	7,944	18,365	10,421	131.2	4.3	8.0	112.64	169.11	....	.154	.0124	.0113	.00802	.00546
Vandalia	727	829	5,922	7,827	1,905	32.2	8.1	9.4	74.46	104.99	.121	.105	.0119	.0078	.00718	.00580
Total	13,306	14,891	148,963	217,027	68,064	45.7	11.2	14.5	143.63	138.18	.112	.110	.0102	.0080	.00645	.00625
Western Classification.																
Atch., Top. & Santa Fe.	7,426	9,350	27,486	46,605	19,119	69.6	3.7	5.0	349.19	403.00	.073	.076	.0079	.0068	.00976	.00957
Chicago & Alton	855	970	9,386	10,548	1,162	12.4	10.9	10.9	176.16	165.94	.135	.109	.0148	.0076	.00794	.00604
Chic. & Eastern Ill....	711	948	8,206	18,700	10,494	127.9	11.5	19.7	144.70	155.46	.132	.171	.0096	.0096	.00483	.00480
Chicago & Northwestern	5,219	7,623	40,846	57,413	16,567	40.6	7.8	7.5	151.30	144.46	.108	.167	.0106	.0106	.00830	.00904
Chic., Burl. & Quincy..	7,546	9,134	42,287	51,362	9,075	21.2	5.6	5.6	254.87	250.19	....	.092	.0111	.0063	.00851	.00690
Chicago Great Western.	930	818	5,782	7,438	1,656	28.6	6.2	9.1	301.68	271.20	.087	.087	.0081	.0077	.00720	.00656
Chic., Mil. & St. Paul..	6,423	7,187	35,740	42,533	6,793	19.0	5.6	5.9	189.07	180.29	.093	.088	.0106	.0082	.00929	.00855
Chic., Rock Isl. & Pacific	3,647	7,780	17,150	41,261	24,111	140.6	4.7	5.3	213.00	219.47	.094	.111	.0096	.0086	.00990	.00844
Chic., St. Paul, M. & O.	1,557	1,711	10,253	11,887	1,634	15.9	6.6	6.9	160.55	144.97	.149	.174	.0135	.0111	.00971	.00884
Colorado & Southern...	762	1,858	2,979	9,049	6,070	203.7	3.9	4.9	101.00	151.00	.108	.124	.0115	.0088	.01242	.00942
Denver & Rio Grande...	1,674	2,552	8,359	10,262	1,903	22.8	4.9	4.0	....	128.70	.118	.108	....	.0091	....	.01345
Dul., S. S. & Atlantic ..	585	591	2,697	2,847	150	5.5	4.6	4.8	49.07	72.40	....	....	.0209	.0120	.01221	.00858
Great Northern	5,418	6,109	21,484	38,385	16,901	78.7	3.9	6.3	192.00	254.46	.104	.110	.0085	.0063	.00899	.00684
Illinois Central	3,996	4,377	32,439	56,949	24,510	75.6	8.1	13.0	213.83	244.84	.092	.116	.0094	.0086	.00651	.00576
Iowa Central	510	558	2,238	2,968	730	32.6	4.4	5.3	152.30	166.67	.099	.112	.0084	.0071	.00696	.00604
Kansas City Southern..	833	827	5,118	7,285	2,167	42.3	6.1	8.8	304.41	278.34	.118	.113	.0091	.0066	.00613	.00636
Minn. & St. Louis	597	799	3,066	4,078	1,012	33.0	5.1	5.1	108.79	97.38	.196	.203	.0155	.0151	.01212	.00995
Minn., St. P. & S. S. M.	1,255	2,282	6,631	12,795	6,164	92.9	5.3	5.6	194.65	224.70	.129	.143	.0109	.0096	.00658	.00716
Missouri Pacific	4,938	6,376	25,186	36,932	11,746	46.6	5.1	5.8	236.24	228.57	.102	.114	.0095	.0074	.00834	.00715
Mo., Kan. & Texas.....	2,218	3,072	9,669	18,796	9,127	94.4	4.4	6.1	298.93	244.74	.073	.105	.0082	.0110	.00840	.01076
Northern Pacific	5,006	5,448	23,138	42,320	19,182	82.9	4.6	7.8	309.60	328.80	.105	.108	.0104	.0077	.00987	.00879
St. L. & San Francisco.	†1,659	5,062	5,974	26,702	20,728	346.9	3.6									

COMPARATIVE SUMMARY OF FREIGHT CARS IN SERVICE ON RAILWAYS OF THE UNITED STATES—1900 AND 1908.

(NOTE.—Narrow-gage cars excluded. Non-revenue cars excluded. Company freight included.)

	Miles.		Freight equipment.		In-crease.	Per cent. of ch'ge.	Freight cars per mile of road.		Average length of haul.		Freight cars—Per 1,000 freight-car miles.				Rate, per ton-mile, dollars.		Fr't cars per \$1,000 freight earnings.	
	1900.	1908.	1900.	1908.			1900.	1908.	1900.	1908.	1900.	1908.	1900.	1908.	1900.	1908.	1900.	1908.
New England Roads.																		
Boston & Maine	1,787	2,288	12,230	23,964	11,734	95.9	6.8	10.5	66.99	106.91	.126	.119	.0146	.0111	.01440	.01045	1.02	1.07
Central Vermont	513	536	2,006	2,866	860	42.8	3.9	5.3	94.97	77.56	.063	.112	.0079	.0119	.00880	.00960	0.90	1.23
Maine Central	816	931	3,586	7,223	3,637	101.4	4.4	7.8	81.11	81.61	.163	.163	.0123	.0150	.01130	.01062	1.09	1.42
N. Y., N. H. & Hartford	2,008	2,047	13,116	29,821	16,705	127.4	6.5	14.6	85.36	94.83	.076	.156	.0097	.0167	.01451	.01414	0.67	1.18
Total	5,124	5,802	30,938	63,874	32,936	106.5	6.0	9.6	82.11	90.23	.107	.138	.0112	.0137	.01225	.01120	0.92	1.23
Trunk Line Roads.																		
Baltimore & Ohio	3,199	3,992	61,708	82,592	20,884	33.8	19.3	20.7	194.81	197.77	.128	.114	.0068	.0084	.00412	.00569	1.96	1.48
Buf., Roch. & Pitts....	472	568	8,858	15,349	6,491	73.3	18.7	27.0	136.16	145.10	.139	.217	.0097	.0118	.00470	.00493	1.99	2.40
Central of New Jersey.	639	610	15,002	21,247	6,245	41.6	23.4	34.8	77.88	78.84	.153	.165	.0118	.0102	.00871	.00845	1.36	1.22
Chesapeake & Ohio	1,476	1,840	17,270	34,252	16,982	98.3	21.6	18.6	302.00	274.00	.082	.135	.0058	.0076	.00343	.00432	1.71	1.77
Delaware & Hudson....	665	845	13,030	21,235	8,205	62.9	19.6	25.1	94.46	121.23	.147	.156	.0113	.0099	.00789	.00710	1.54	1.39
Del., Lack. & Western...	947	958	27,287	27,211	*76	0.3	28.8	28.2	151.00	179.50	....	....	.0144	.0088	.00808	.00785	1.79	1.11
Erie	2,104	2,171	46,225	54,909	8,684	18.8	21.9	25.3	191.40	168.35	.101	.144	.0089	.0097	.00559	.00600	1.60	1.62
Lehigh Valley	1,382	1,446	34,954	42,405	7,451	21.3	25.3	29.3	188.08	181.08	.135	.139	.0106	.0088	.00542	.00630	1.97	1.40
N. Y. C. & H. R.	2,817	3,781	59,180	61,882	2,702	4.5	21.1	16.3	163.00	197.00	....	.084	.0088	.0069	.00560	.00643	1.72	1.21
Pennsylvania	3,716	3,980	80,385	130,163	49,778	61.9	21.6	32.7	109.54	167.76	.091	.127	.0067	.0077	.00540	.00569	1.25	1.33
Reading	1,000	1,007	31,824	44,676	12,852	40.4	31.8	44.4	89.42	93.76	.139	.160	.0114	.0101	.00831	.00726	1.50	1.39
Western Maryland	279	543	691	5,949	5,258	760.9	2.5	10.9	51.02	109.86	....	.136	.0038	.0085	.00734	.00655	0.53	1.30
Total	18,696	21,741	396,414	541,870	145,456	36.6	21.2	26.1	145.73	159.52	.093	.131	.0092	.0090	.00622	.00638	1.56	1.47
Southern Classification.																		
Atlantic Coast Line....	1,759	4,407	5,378	24,408	19,030	353.7	3.6	5.5	121.90	142.52	....	.144	.0143	.0170	.01401	.01235	1.02	1.38
Central of Georgia	1,196	1,913	5,041	10,440	5,399	107.1	4.2	5.4	148.86	149.64	.107	.152	.0183	.0123	.01096	.01082	1.26	1.37
Louisville & Nashville..	3,007	4,365	23,402	40,589	17,187	73.4	7.7	9.3	163.00	172.87	.096	.132	.0090	.0101	.00758	.00779	1.13	1.30
Mobile & Ohio.....	876	926	5,389	11,247	5,858	108.7	6.2	12.1	195.63	229.66	....	....	.0076	.0099	.00590	.00631	1.33	1.58
Nash., Chat. & St. Louis	1,189	1,230	5,328	9,440	4,112	77.2	4.4	7.7	151.00	161.00	.113	.300	.0096	.0111	.00880	.00890	1.10	1.24
Norfolk & Western	1,551	1,881	18,656	37,276	18,620	100.0	12.0	19.8	253.41	267.94	.085	.125	.0068	.0075	.00430	.00481	1.58	1.55
Seaboard Air Line.(1901)	2,604	2,611	8,335	13,902	5,567	66.8	3.2	5.3	153.32	149.96	.119	.135	.0136	.0148	.01180	.01124	1.14	1.32
Southern	6,306	7,489	26,814	54,086	27,272	101.7	4.2	7.2	168.82	154.05	.107	.161	.0116	.0155	.00916	.00979	1.27	1.58
Total	18,488	24,822	98,343	201,388	103,045	104.8	5.3	9.0	169.49	178.45	.105	.164	.0114	.0123	.00906	.00900	1.23	1.41
Central Classification.																		
Chic., Ind. & Louisville	546	616	5,440	5,563	123	2.3	9.9	9.0	153.00	146.00	.155	.155	.0141	.0135	.00757	.00822	1.86	1.64
Cin., Ham. & Dayton...	652	1,038	7,838	12,704	4,866	62.1	12.0	12.2	108.96	114.19	....	.197	.0122	.0136	.00610	.00624	2.00	2.27
C., C. C. & St. Louis...	1,891	1,982	15,484	22,670	7,186	46.4	8.2	11.4	169.30	146.20	.094	.100	.0083	.0079	.00583	.00568	1.42	1.44
Grand Rapids & Indiana	582	592	3,015	3,233	218	7.2	5.2	5.5	90.12	95.99	.140	.107	.0156	.0092	.00870	.00730	1.88	1.25
Lake Erie & Western...	725	886	5,549	4,663	*886	15.9	7.6	5.0	153.51	120.40	.137	.116	.0110	.0092	.00614	.00738	1.89	1.33
Lake Shore & Mich. So.	1,411	1,511	19,958	34,549	14,591	73.1	14.1	22.9	178.00	173.50	.067	.091	.0055	.0068	.00505	.00525	1.09	1.33
Michigan Central.....	1,635	1,746	14,219	18,579	4,360	30.6	8.6	10.6	193.50	171.00	....	.076	.0070	.0068	.00592	.00627	1.19	1.09
N. Y., Chic. & St. Louis	513	523	6,743	11,877	5,134	76.1	13.1	22.7	297.00	229.00	.059	.086	.0055	.0071	.00478	.00526	1.16	1.50
Pennsylvania Co.....	1,396	1,416	43,967	53,044	9,077	20.6	31.5	37.4	77.95	79.93	.177	.172	.0135	.0113	.00590	.00610	2.30	1.81
P., C. C. & St. Louis...	1,407	1,472	12,884	22,905	10,021	77.7	9.1	15.6	111.14	118.07	.056	.084	.0052	.0071	.00620	.00640	0.84	1.07
Pere Marquette	1,821	2,298	7,944	18,558	10,614	137.4	4.3	8.2	112.64	169.01	....	.148	.0124	.0117	.00802	.00602	1.55	2.09
Vandalia	727	829	5,922	7,832	1,910	32.2	8.1	9.4	74.46	99.78	.121	.132	.0119	.0100	.00718	.00690	1.66	1.41
Total	13,306	14,909	148,963	216,477	67,514	45.3	11.2	14.2	143.63	146.92	.112	.122	.0102	.0095	.00645	.00642	1.57	1.52
Western Classification.																		
Atch., Top. & Santa Fe.	7,426	9,431	27,486	51,834	24,348	88.6	3.7	5.5	349.19	392.24	.073	.089	.0079	.0065	.00976	.00949	0.81	0.84
Chicago & Alton	855	998	9,386	10,395	1,009	10.8	10.9	10.4	176.16	151.85	.135	.112	.0148	.0076	.00794	.00610	1.87	1.36
Chic. & Eastern Ill....	711	957	8,206	19,983	11,777	143.5	11.5	20.9	144.70	156.19	.132	.192	.0096	.0105	.00483	.00470	1.99	2.34
Chicago & Northwestern	5,219	7,632	40,846	57,620	16,774	41.1	7.8	7.6	151.30	158.07	.108	.177	.0106	.0119	.00830	.00870	1.28	1.37
Chic., Burl. & Quincy...	7,546	9,282	42,287	53,156	10,869	25.7	5.6	5.7	254.87	240.82	....	.099	.0111	.0068	.00851	.00800	1.29	1.00
Chicago Great Western.	930	818	5,782	7,939	2,157	37.3	6.2	9.7	301.68	267.71	.087	.105	.0081	.0094	.00720	.00645	1.13	1.44
Chic., Mil. & St. Paul...	6,423	7,301	35,740	44,086	8,346	33.4	5.6	6.0	189.07	190.17	.093	.095	.0106	.0077	.00929	.00811	1.14	1.09
Chic., Rock Isl. & Pacific	3,647	7,970	17,150	39,581	22,431	130.8	4.7	4.9	213.00	221.40	.094	.105	.0096	.0087	.00990	.00940	1.08	1.04
Chic., St. P., M. & Om.	1,557	1,730	10,253	12,430	2,177	21.2	6.6	7.2	160.55	140.17	.149	....	.0135	.0134	.00971	.00893	1.39	1.50
Colorado & Southern...	762	1,952	2,979	9,166	6,187	207.7	3.9	4.7	101.00	132.00	.108	.130	.0115	.0093	.01242	.01034	0.93	0.92
Denver & Rio Grande...	1,674	2,499	8,359	11,673	3,314	39.6	4.9	4.7	....	117.02	.118	.137	....	.0108	....	.01330	1.09	0.81
Dul., S. S. & Atlantic...	585	595	2,697	2,813	116	4.3	4.6	4.7	49.07	61.40	....	....	.0209	.0155	.01221	.00987	1.70	1.57
Great Northern	5,418	6,637	21,484	42,131	20,647	96.1	3.9	6.3	192.00	268.00	.104	.128	.0085	.0070	.00899	.00780	0.93	1.05
Illinois Central	3,996	4,594	32,439	60,871	28,432	87.7	8.1	13.2	213.83	241.09	.092	.130	.0094	.0084	.00651	.00586	1.45	1.72
Iowa Central	510	558	2,238	2,924	686	30.6	4.4	5.2	152.30	175.65	.099	.110	.0084	.0069	.00696	.00592	1.21	1.23
Kansas City Southern...	833	828	5,118	7,148	2,030	39.7	6.1	8.6	304.41	278.64	.118	.111	.0091	.0069	.00613	.00723		

COMPARATIVE SUMMARY OF FREIGHT CARS IN SERVICE ON RAILWAYS OF THE UNITED STATES—1907 AND 1908.

(NOTE.—Narrow-gage cars excluded. Non-revenue cars excluded. Company freight included.)

	Miles.		Freight equipment.		In-crease.	Per cent. of ch'ge.	Freight cars per mile of road.		Average length of haul.		Freight cars per 1,000 freight-car miles.		Per 1,000 rev'ue-ton miles.		Rate, per ton-mile, dollars.		Fr't cars per \$1,000 freight earnings.	
	1907.	1908.	1907.	1908.			1907.	1908.	1907.	1908.	1907.	1908.	1907.	1908.	1907.	1908.	1907.	1908.
New England Roads.																		
Boston & Maine.....	2,288	2,288	20,376	23,964	3,588	17.6	8.8	10.5	98.74	106.91	.098	.119	.0088	.0111	.01097	.01045	0.80	1.07
Central Vermont	536	536	2,983	2,866	*117	3.9	5.5	5.3	79.28	77.56	.105	.112	.0113	.0119	.00947	.00960	1.19	1.23
Maine Central	845	931	7,174	7,223	49	0.7	8.4	7.8	88.56	81.61	.167	.163	.0146	.0150	.01018	.01062	1.43	1.42
N. Y., N. H. & Hartford	2,060	2,047	19,776	29,821	10,045	50.8	9.6	14.6	90.20	94.83	.098	.156	.0102	.0167	.01472	.01414	0.70	1.18
Total	5,729	5,802	50,309	63,874	13,565	26.9	8.8	9.6	89.19	90.23	.117	.138	.0112	.0137	.01134	.01120	1.03	1.23
Trunk Line Roads.																		
Baltimore & Ohio	4,006	3,992	78,073	82,592	4,519	5.8	19.5	20.7	193.85	197.77	.104	.114	.0068	.0084	.00570	.00569	1.20	1.48
Bul., Roch. & Pitts....	569	568	13,508	15,349	1,841	13.6	23.7	27.0	145.70	145.10	.177	.217	.0097	.0118	.00498	.00493	1.95	2.40
Central of New Jersey..	610	610	21,537	21,247	*290	1.3	35.2	34.8	75.27	78.84	.160	.165	.0102	.0102	.00840	.00845	1.21	1.22
Chesapeake & Ohio	1,827	1,840	30,535	34,252	3,717	12.2	16.7	18.6	274.00	274.00	.119	.135	.0066	.0076	.00432	.00432	1.53	1.75
Delaware & Hudson ...	845	845	21,458	21,235	*223	1.0	25.4	25.1	121.70	121.23	.151	.156	.0085	.0099	.00663	.00710	1.29	1.39
Del., Lack. & Western...	958	958	27,441	27,211	*230	0.8	28.7	28.2	175.00	179.50	.109	.109	.0078	.0088	.00765	.00785	1.03	1.11
Erie	2,151	2,171	51,514	54,909	3,395	6.6	23.9	25.3	160.22	168.35	.115	.144	.0083	.0097	.00614	.00600	1.33	1.62
Lehigh Valley	1,440	1,446	41,431	42,405	974	2.4	28.8	29.3	169.43	181.08	.130	.139	.0087	.0088	.00631	.00630	1.37	1.40
N. Y. C. & H. R.	3,782	3,781	66,012	61,882	*4,130	6.2	17.4	16.3	195.00	197.00	.081	.084	.0061	.0069	.00624	.00643	1.11	1.21
Pennsylvania	3,903	3,980	128,024	130,163	2,139	1.7	32.9	32.7	162.33	167.76	.102	.127	.0059	.0077	.00527	.00569	1.03	1.33
Reading	1,000	1,007	40,970	44,676	3,706	9.0	40.0	44.4	90.90	93.76	.141	.160	.0087	.0101	.00748	.00726	1.17	1.39
Western Maryland	540	543	6,224	5,949	*275	4.4	11.5	10.9	95.24	109.86	.099	.136	.0096	.0085	.00678	.00655	1.41	1.30
Total	21,630	21,741	526,727	541,870	15,143	2.9	24.3	26.1	154.89	159.52	.124	.131	.0081	.0090	.00637	.00638	1.30	1.47
Southern Classification.																		
Atlantic Coast Line ...	4,361	4,407	22,724	24,408	1,684	7.4	5.2	5.5	147.66	142.52	.126	.144	.0152	.0170	.01235	.01235	1.23	1.38
Central of Georgia	1,899	1,913	10,218	10,440	222	2.2	5.4	5.4	149.76	149.64	.137	.152	.0106	.0123	.00853	.01082	1.25	1.37
Louisville & Nashville...	4,343	4,365	39,528	40,589	1,061	2.7	9.1	9.3	168.45	172.87	.116	.132	.0090	.0101	.00801	.00779	1.12	1.30
Mobile & Ohio	926	926	10,091	11,247	1,156	11.4	10.9	12.1	244.65	229.66	.166	.166	.0077	.0099	.00620	.00631	1.25	1.58
Nash., Chat. & St. Louis	1,230	1,230	9,080	9,440	360	3.9	7.4	7.7	170.43	161.00	.373	.300	.0090	.0111	.00887	.00890	1.01	1.24
Norfolk & Western	1,876	1,881	36,910	37,276	366	1.0	19.7	19.8	260.24	267.94	.116	.125	.0074	.0075	.00523	.00481	1.41	1.55
Seaboard Air Line.....	2,611	2,611	12,210	13,902	1,692	13.9	4.7	5.3	159.25	149.96	.121	.135	.0119	.0148	.01118	.01124	1.07	1.32
Southern	7,547	7,489	55,409	54,086	*1,323	2.4	7.3	7.2	165.25	154.05	.164	.161	.0124	.0155	.00834	.00979	1.48	1.58
Total	24,793	24,822	196,170	201,388	5,218	2.7	7.9	9.0	183.21	178.45	.157	.164	.0104	.0123	.00859	.00900	1.24	1.41
Central Classification.																		
Chic., Ind. & Louisville.	600	616	5,428	5,563	135	2.5	9.0	9.0	153.00	146.00	.134	.155	.0105	.0135	.00810	.00822	1.29	1.64
Cin., Ham. & Dayton...	1,038	1,038	13,461	12,704	*757	5.6	13.0	12.2	115.85	114.19	.201	.197	.0125	.0136	.00590	.00624	2.11	2.27
C., C. C. & St. Louis...	1,983	1,982	23,189	22,670	*519	2.2	11.9	11.4	153.20	146.20	.107	.100	.0073	.0079	.00572	.00568	1.34	1.44
Grand Rapids & Indiana	582	592	3,232	3,233	1	0.0	5.5	5.5	102.77	95.99	.099	.107	.0068	.0092	.00680	.00730	1.01	1.25
Lake Erie & Western...	886	886	4,916	4,663	*253	5.1	5.5	5.0	130.22	120.40	.116	.116	.0083	.0092	.00702	.00738	1.23	1.33
Lake Shore & Mich. So.	1,520	1,511	35,389	34,549	*840	2.4	23.2	22.9	159.80	173.50	.091	.091	.0058	.0068	.00533	.00525	1.13	1.33
Michigan Central	1,746	1,746	18,890	18,579	*311	1.6	10.8	10.6	170.00	171.00	.073	.076	.0059	.0068	.00641	.00627	0.94	1.09
N. Y., Chic. & St. Louis	523	523	10,576	11,877	1,301	12.3	20.2	22.7	224.00	229.00	.079	.086	.0062	.0071	.00511	.00526	1.22	1.50
Pennsylvania Co.	1,414	1,416	52,844	53,044	200	0.4	37.4	37.4	75.32	79.93	.143	.172	.0078	.0113	.00600	.00610	1.31	1.81
P., C. C. & St. Louis...	1,472	1,472	22,910	22,905	*5	0.0	15.6	15.6	99.95	118.07	.072	.084	.0053	.0071	.00630	.00640	0.83	1.07
Pere Marquette	2,298	2,298	18,365	18,858	493	2.7	8.0	8.2	169.11	169.01	.154	.148	.0113	.0117	.00546	.00602	1.85	2.09
Vandalia	829	829	7,827	7,832	5	0.1	9.4	9.4	104.99	99.78	.105	.132	.0078	.0100	.00580	.00690	1.14	1.41
Total	14,891	14,909	217,027	216,477	*550	0.2	14.5	14.2	138.18	146.92	.110	.122	.0080	.0095	.00625	.00642	1.28	1.52
Western Classification.																		
Atch., Top. & Santa Fe.	9,350	9,431	46,605	51,834	5,229	11.2	5.0	5.5	403.00	392.24	.076	.089	.0068	.0065	.00957	.00949	0.71	0.84
Chicago & Alton.....	970	998	10,548	10,395	*153	1.4	10.9	10.4	165.94	151.85	.109	.112	.0076	.0076	.00604	.00610	1.26	1.36
Chic. & Eastern Ill.	948	957	18,700	19,983	1,283	6.9	19.7	20.9	155.46	156.19	.171	.192	.0096	.0105	.00480	.00470	2.01	2.34
Chicago & Northwestern	7,623	7,632	57,413	57,620	207	0.4	7.5	7.6	144.46	158.07	.167	.177	.0106	.0119	.00904	.00870	1.17	1.37
Chic., Burl. & Quincy...	9,134	9,282	51,362	53,156	1,794	3.4	5.6	5.7	250.19	240.82	.092	.099	.0063	.0068	.00690	.00800	0.91	1.00
Chicago Great Western.	818	818	7,438	7,939	501	6.9	9.1	9.7	271.20	267.71	.087	.105	.0077	.0094	.00656	.00645	1.17	1.46
Chic., Mil. & St. Paul...	7,187	7,301	42,533	44,086	1,553	3.6	5.9	6.0	180.29	190.17	.088	.095	.0082	.0077	.00855	.00811	0.96	1.09
Chic., Rock Isl. & Pacific	7,780	7,970	41,261	39,581	*1,680	4.1	5.3	4.9	219.47	221.40	.111	.105	.0086	.0087	.00844	.00940	1.01	1.04
Chic., St. P., M. & Om...	1,711	1,730	11,887	12,430	543	4.6	6.9	7.2	144.97	140.17	.174	.174	.0111	.0134	.00884	.00893	1.26	1.50
Colorado & Southern ...	1,858	1,952	9,049	9,166	117	1.3	4.9	4.7	151.00	132.00	.124	.130	.0088	.0093	.00942	.01034	0.93	0.92
Denver & Rio Grande...	2,552	2,499	10,262	11,673	1,411	13.7	4.0	4.7	128.70	117.02	.108	.137	.0091	.0108	.01345	.01330	0.67	0.81
Duluth, S. S. & Atlantic	591	595	2,847	2,813	*34	1.2	4.8	4.7	72.40	61.40	.100	.100	.0120	.0155	.00858	.00987	1.39	1.57
Great Northern	6,109	6,637	38,385	42,131	3,746	9.8	6.3	6.3	254.46	268.00	.110	.128	.0063	.0070	.00684	.00780	0.92	1.05
Illinois Central	4,377	4,594	56,949	60,871	3,922	6.9	13.0	13.2	244.84	241.09	.116	.130	.0086	.0084	.00576	.00586	1.50	1.72
Iowa Central	558	558	2,968	2,924	*44	1.5	5.3	5.2	166.67	175.65	.112	.110	.0071	.0069	.00604	.00592	1.18	1.23
Kansas City Southern...	828	828	7,285	7,148	*137	1.9	8.8	8.6	278.34	278.64	.113	.111	.0066					

RAILWAY RATE MAKING IN PRACTICE.

BY WILLIAM Z. RIPLEY,
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CHAPTER IV.

THE INTRICACY OF FREIGHT RATE ADJUSTMENT (CONT'D).

Not only must rates of all sorts be delicately adjusted to suit the immediate exigencies of trade; they must be constantly modified in order to keep pace with its ever changing conditions. This is peculiarly true of a rapidly growing country like the United States. An admirable instance is afforded by the complaint of the Lincoln Commercial Club before the Interstate Commerce Commission.* Lincoln, Nebraska, lies about 55 miles southwest of Omaha. Originally all its supplies came from the East, as both cities were for a time out-posts of civilization. The coal supply came from Iowa and Illinois and the salt from Michigan. On these and most other commodities the rates to Lincoln were made up of a through rate from the East to the Missouri river plus the local rate on to destination. The city of Lincoln thus paid considerably more than Omaha for all of its supplies. Gradually conditions have changed until in 1907 it appeared that over half the soft coal consumed in Lincoln was brought from Kansas and Missouri; four-fifths of the lumber from the South and nearly all the rest from the Pacific coast; glass and salt from the gas belt and salt beds of Kansas and a great deal of beet sugar from the western fields. For a large proportion of these and other supplies, Lincoln was actually as near or nearer the point of production than Omaha, and yet the difficulties of effecting an adjustment between rival carriers had prevented any modification of rates corresponding to these changes in economic conditions. On every one of these commodities the rate to Lincoln remained steadily higher than to Omaha, regardless of the source of supply. Unanimous consent was necessary for readjustment. So long as any single road refused assent, a general rate disturbance might be precipitated by any independent action. The beneficial effect of the exercise of governmental authority, powerful enough over all interested parties to compel acquiescence, has been clearly apparent in affording relief. A similar instance in the state of Wisconsin is afforded by the compulsory readjustment of the freight rate on wood pulp, lumber and sawed logs.† On investigation it appeared that despite a very much lower commercial value for the raw material used in paper manufacture, the rates on pulp wood were more than double those on logs to be sawed up for lumber. It appeared, moreover, that this apparent anomaly was due not so much to high rates on the pulp wood as to very low rates on sawed logs. This latter rate for many years had been fixed at a very low figure because originally the bulk of such logs, cut in the river bottoms, was floated down stream to mills along the Mississippi river. Competition with lumber raft rates originally determined the charges on lumber by rail. The paper industry did not begin until these conditions of water competition had quite disappeared. Gradually with the progress of deforestation all the timber is now found on the uplands far from navigable water courses; so that the rates to-day are not at all influenced by competitive rates on the lumber rafts down river. Nevertheless the old tariffs on lumber remained in force despite the changed conditions, while the new rates on pulp wood were fixed independently of any rates by water. It was only after careful investigation that the injustice to the paper manufacturers from the disparity in charges appeared. Here again it was the rigidity and interlocked complexity of adjustment which placed it in the power of one road to block change of any sort.‡ The compulsory

exercise of governmental authority cut the Gordian knot with the result that substantial justice now obtains.

From the preceding statements it will be observed that carriers have another important commercial function beside that of equalizing industrial conditions. They also act in a protective or insurance capacity to the merchant or manufacturer. The policy of "keeping everyone in business" implies not only variety but variability of conditions. Capital is proverbially timid. It will not venture into a new and uncertain enterprise unless either profits are immediate and high; or, if moderate, likely to endure. In any event some guarantee of permanence is required. This guarantee the carrier is often able to offer. It may assume the obligation of protecting its clients; that is of saving them harmless against the intrusion or irruption of hurtful competition. It thus exercises in a certain sense the function of an insurance company, but with this important difference: that while it has the strongest interest in protecting its established industries against ruinous competition from abroad, it may desire to share in some degree in their development and prosperity by way of reward. In this latter sense the relation of the carrier to its clients partakes of a profit-sharing arrangement. One of the broadest issues between American railways and the public at the present time is precisely this: whether the carriers are to share in business profits; or merely, in addition to furnishing transportation, are to collect a fixed fee for a service in the nature of industrial insurance. That it lies in their way to furnish such protection under modern economic practice is an indisputable fact.

This nice question is almost daily pressing for solution at the hands of the Interstate Commerce Commission. It arises every time an increase of freight rates occurs. Take, for example, the Pacific coast lumber cases of 1908. The dissenting opinions of the commission show how debatable the proposition is.* Up to about 1893 the lumber interests of the Pacific coast were quite undeveloped and entirely dependent upon water transportation for reaching markets. At this time low rates of 40 to 60 cents per hundred pounds on forest products to markets in the middle west were introduced, partly to build up the industry and partly to create a back loading for the preponderantly west-bound tonnage of all transcontinental lines. Under these rates the business has enormously developed until on the Northern Pacific road in 1906 the shipments of lumber east-bound amounted to one-third of its entire traffic both ways, and yielded nearly one-fifth of its freight revenue. So greatly had this traffic expanded that it aided, if not actually produced, a reversal of the direction of transcontinental empties. Practically all these roads now have an excess of tonnage to the east whereas ten years ago much the larger volume of freight was moving westward. Meantime the lumbermen under the stimulus of these rates, together with the phenomenal rise in the price of lumber, had been wonderfully prosperous. The price of logs had risen since 1893 from about \$2.50 per 1,000 ft. to \$13.50 in 1906; partly in consequence of the extraordinary demand consequent on the Valparaiso and San Francisco earthquakes. The mills had moved in from the rivers and the coast, and had become absolutely dependent upon rail transportation for reaching markets. At this stage, and most unfortunately in November, 1907, just at a time of industrial panic, the carriers raised their rates by about ten cents per 100 lbs. The market price of logs had already dropped from \$13.50 per thousand by approximately one-third. These two causes, commercial depression and the increased freight rate, brought about a complete collapse in the industry. And the increased freight rates were contested before the Interstate Commerce Commission in the hope that, as in the southern field the rate increases from Georgia points had been annulled, these might also be found unreasonable. The broad question concerns the obligation of carriers once having brought about an investment of

*No. 1102, decided April 6, 1908.

†Wisconsin Railroad Commission, 1908.

‡The diverse interests to be reconciled must also include the lumbering centers once "next the stump," but now placed at a relative disadvantage. The Eau Claire lumber case [reprinted in *Railway Problems*, pp. 203-233] should be read in this connection.

*I. C. C. Reports, Nos. 1327, 1329, 1335, 1348, decided in 1908.

capital of the industry to continue to give the same rates as those under which the ventures had been undertaken, due regard being had, of course, to such changes in costs of service as might have ensued. The lumbermen demand that all the increment of profit due to prosperous development shall remain unto them; in other words, that the carriers' share of the increased values shall remain fixed. On the other hand, the railways defend their increases, partly upon the ground of increasing expenses of operation, and partly upon the broader ground that the freight rate being proportioned to the price of the product, should rise in harmony with it. Upon this question the commission is divided, the majority holding in favor of annulling the increase, while the chairman and one other member decided that the increase was justifiable.

Elasticity and quick adaptation to the exigencies of business are peculiarities of American railway operation. Our railway managers have always been most progressive in seeking, in and out of season, to develop new territory and build up traffic. The strongest contrast between Europe and the United States lies in this fact. European railways more often take business as they find it. Our railways *make* it. Much of this business is made possible only by special rates adapted to the case in hand. These need not be secret or discriminating, as has already been observed. For although offered with reference to particular cases, they may be open to all comers. The economic justification lies in the fact that the railway can afford to make a low rate, leaving a bare margin of profit above the extra cost of adding this traffic to that which is already in motion. Such rates cannot exceed a definite figure based upon what the traffic will bear. A higher rate than this would kill the business. Something is contributed toward fixed charges by the new traffic, so far as the railway is concerned; and at the same time the shipper on his part is enabled to enlarge his operations. Yet such a scale of rates if applied to the whole traffic of the railway might be ruinous in the extreme. The domestic shipper of wheat may conceivably be helped rather than injured by a special rate on grain for Liverpool without which the railway would lose the business entirely. To transport California fruit for a mere fraction of the rate per ton mile which is laid upon other traffic may actually enable those other goods to be carried more cheaply than before. Of course, if the other traffic be directly competitive, as for instance in this case, oranges from Florida, that is an entirely different matter. Railway representatives rightly insist upon these special rates to develop new business as a boon to the commercial world. They contrast them with the hard and fast schedules of European railways. They allege that such elasticity loosens the joints of competition, "keeps everyone in business," equalizes prices over large areas and is in fact the life of trade. One of the stock objections to railway regulation is that it may lessen this elasticity, "substitute mile posts for brains" and produce stagnation in place of activity.

Paradoxical as it may seem, a certain rigidity of rate schedules is a natural consequence of the very delicacy with which individual rates are adjusted to meet the demands of trade. Each road is jealously and aggressively alert to protect its own constituency regardless of the rights of others. No single traffic manager is free to grant reductions of rates, even when considered to be just, by reason of the opposition of competing lines. The consent of every one of these interests is necessary in order to insure stability, and the penalty for acting independently may be a rate war, disastrously affecting relations with connecting lines. Thus, for example, in the South the Southern Railway for some time was willing to concede as a measure of justice a reduction of rates on cotton from Mississippi river points to the mills in North and South Carolina.* The growth of the textile industry had resulted

in a demand for cotton far exceeding the production of the Carolinas. At the same time the increasing attention devoted to manufacturing of a higher grade had forced the manufacturers to draw upon the long-staple supplies of the Mississippi bottom lands. The Piedmont cotton was too short in fiber for the finer sorts of goods. The Carolina mills were, however, compelled to pay a higher rate upon cotton from such points as Memphis than was paid for the long haul up to New England. Thus, for instance, as late as 1900 rates were 59 cents to South Carolina, while they were only 55½ cents per hundred pounds from the same points to New England mills. This was obviously unjust. But the Southern Railway alone, interested in the welfare of its Carolina clients, was powerless to act without the consent of its competitors operating from Memphis west of the Alleghanies. These latter lines having no interest in the southern mills and a unity of interest in the long haul traversed to New England, sought to prevent an equalization of the differences. Controlling rates also on cotton for export to various sea-ports they were for a long time able to prevent a change. On the other hand, in the same territory the railways operating south from Cincinnati and Louisville desired to reduce rates on manufactured products from the central west.* These were the very lines which in the former instance prevented the reduction of cotton rates on the Southern Railway to Carolina points by threats to meet such reductions by cutting their own rates on cotton going north through the Ohio gateways. Yet a reduction of their rates on manufactures for building up western trade threatened the business of the Southern Railway, which had been mainly interested in the traffic from Atlanta seaboard points. It may readily be seen that this situation, extending to practically every important point, "jacked up" all these rates, not because of their inherent reasonableness and not even because the railways independently acknowledged them to be just, but simply and solely because any disturbance of this house of cards might lead to a general downfall of the whole system.

(To be continued.)

DETAILS OF ARTICULATED MALLET COMPOUND LOCOMOTIVE FOR THE SOUTHERN PACIFIC.

In addition to the detail engravings of the large Mallet locomotive, built by the Baldwin Locomotive Works for the Southern Pacific (*Railroad Age Gazette*, April 30), a few additional ones are presented herewith.

Attention has been called to the change in the valves from those of the Great Northern locomotives. The Southern Pacific Mallets are fitted with piston valves. The valve chambers of both the high and the low-pressure cylinders are fitted with the Sheedy relief or by-pass valve. A passage connecting the two ends of the cylinder is closed by valves that shut under steam pressure when the throttle is open, but are opened by springs when the throttle is closed. When open, the passage permits the contained air to be churned back and forth between the two ends of the cylinder, while the engine is drifting with no danger of drawing in gases from the smoke-box or receiver. Both valve chambers are fitted with the usual cast-iron bushings, having ports 1½ in. wide for each cylinder, that discharge into the cored cylinder posts, which are 1¾ in. wide for the high and 2 in. wide for the low-pressure cylinder. It will be noticed, too, that the valve chamber has the same diameter, 15 in., for each cylinder.

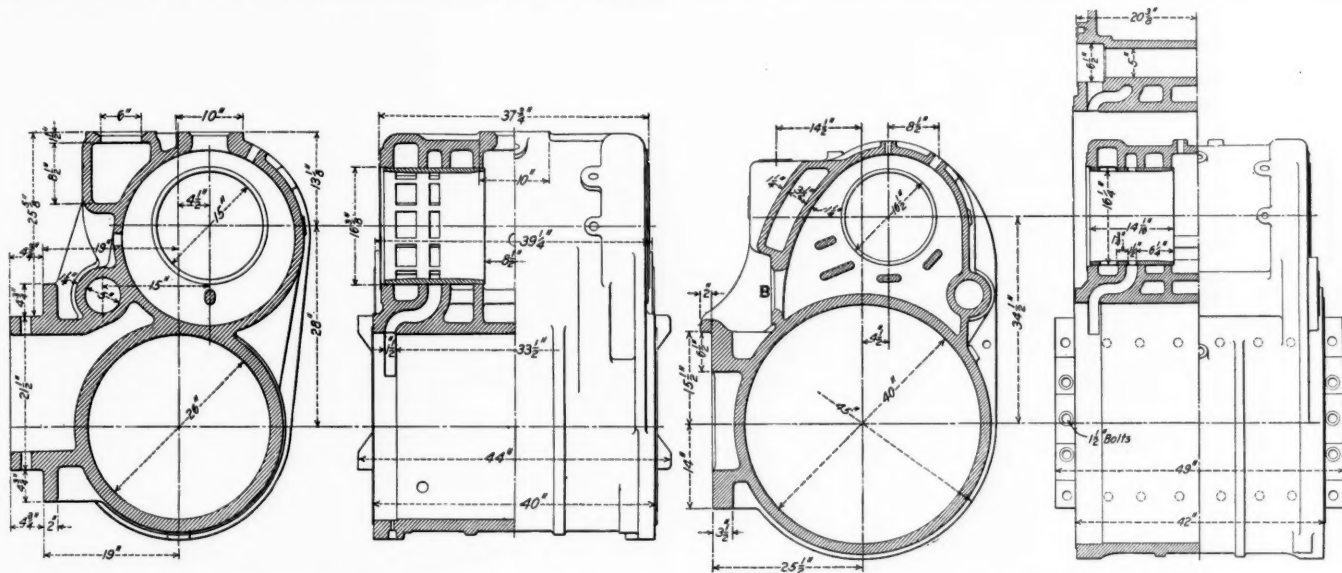
Owing to the difference between the front and back frames, the method of cylinder fastening differs. At the rear end the frames are of the double bar type, extending the whole length, and the high-pressure cylinders are fastened by 1½ in. bolts driven both horizontally and vertically through both rails

*Arbitration of cotton rates etc., Nov. 15 and 16, 1900; pamphlet arguments of Southern vs. Illinois Central Railways.

*This was the gist of the complaint in the maximum freight rate cases; reprinted in Ripley, *Railway Problems*, pp. 145-190.

and staggered. At the front the bar frame ends at the cylinders and the forward portion is a steel casting with a heavy slab section at the point of cylinder attachment. This construction was probably necessitated by the large diameter of the base, which is 40 in. and comes within $5\frac{1}{2}$ in. of the face of the frame. As it is, each cylinder is held by 22 bolts, $1\frac{1}{2}$ in. in diameter and arranged to drive through the flanges of the casting and the slab portion of the frame. The weight

the saddle has no connection with the smoke-box and is of a somewhat simpler construction. The illustration of this saddle, when taken in connection with that of the steam pipe to the low-pressure cylinder on page 936 of the issue of April 30, gave an idea of the path of the steam to the cylinder. It is delivered by the steam pipe to the opening A in the saddle and discharged at B on either side, whence it is led by the elbow pipe (shown on page 936, April 30) to the low-pressure



High and Low Pressure Cylinders; Mallet Articulated Compound for the Southern Pacific.

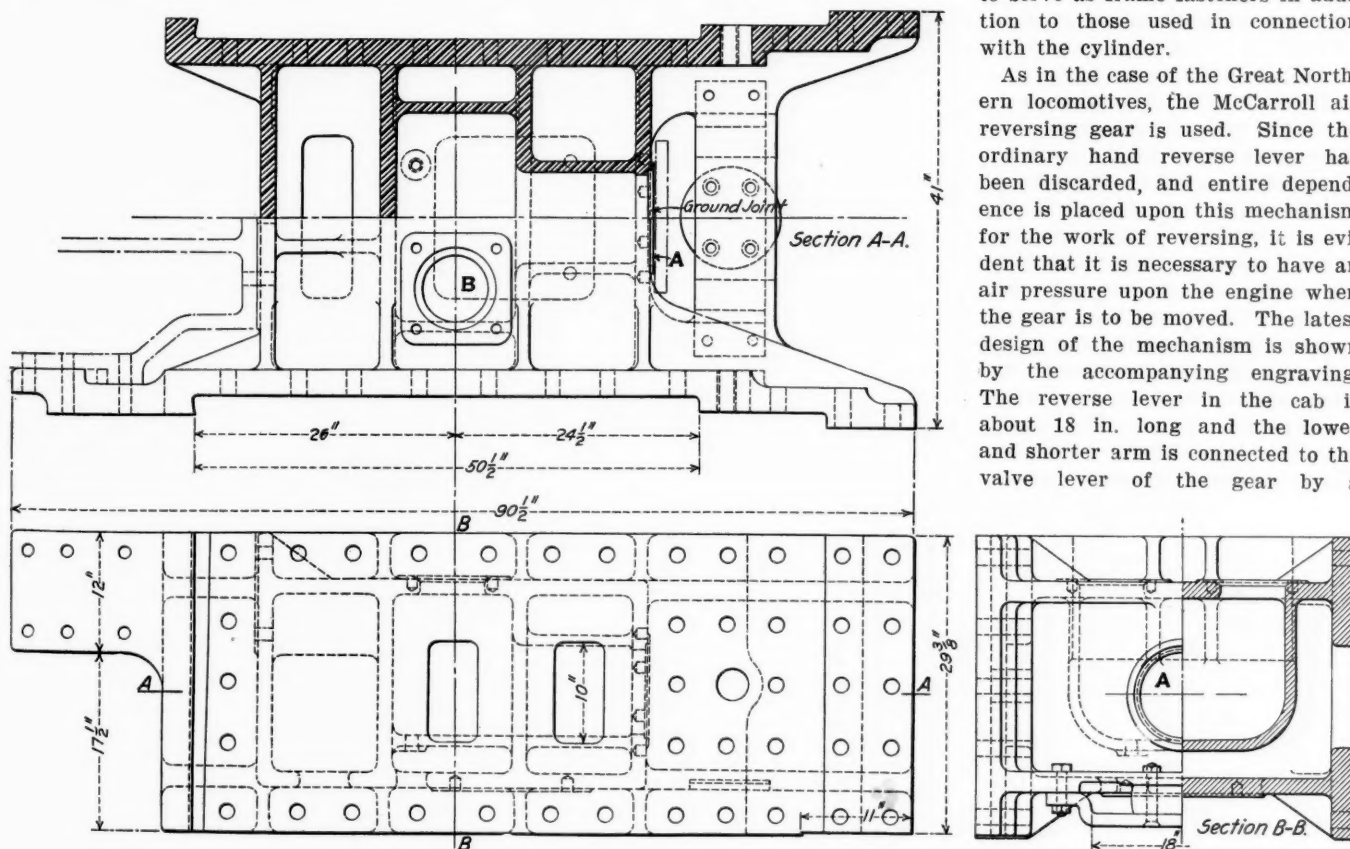
is carried by a lip bearing on the top of the frame, and the end thrust by the usual keys and wedges. Both cylinders are stiffened by ribs about the barrel.

At the high-pressure cylinders, the saddle has the usual bearing for the boiler (illustrated April 30). As the low-pressure cylinders are free to move laterally with the forward truck,

cylinder at B. The method of taking the exhaust to the smoke-box has already been described.

The saddle also serves as a means of stiffening the connection between the front and rear sections of the frame, and for this purpose has a slab projection extending to the rear through which there are 20 bolts of $1\frac{1}{2}$ in. diameter to serve as frame fasteners in addition to those used in connection with the cylinder.

As in the case of the Great Northern locomotives, the McCarroll air reversing gear is used. Since the ordinary hand reverse lever has been discarded, and entire dependence is placed upon this mechanism for the work of reversing, it is evident that it is necessary to have an air pressure upon the engine when the gear is to be moved. The latest design of the mechanism is shown by the accompanying engraving. The reverse lever in the cab is about 18 in. long and the lower and shorter arm is connected to the valve lever of the gear by a



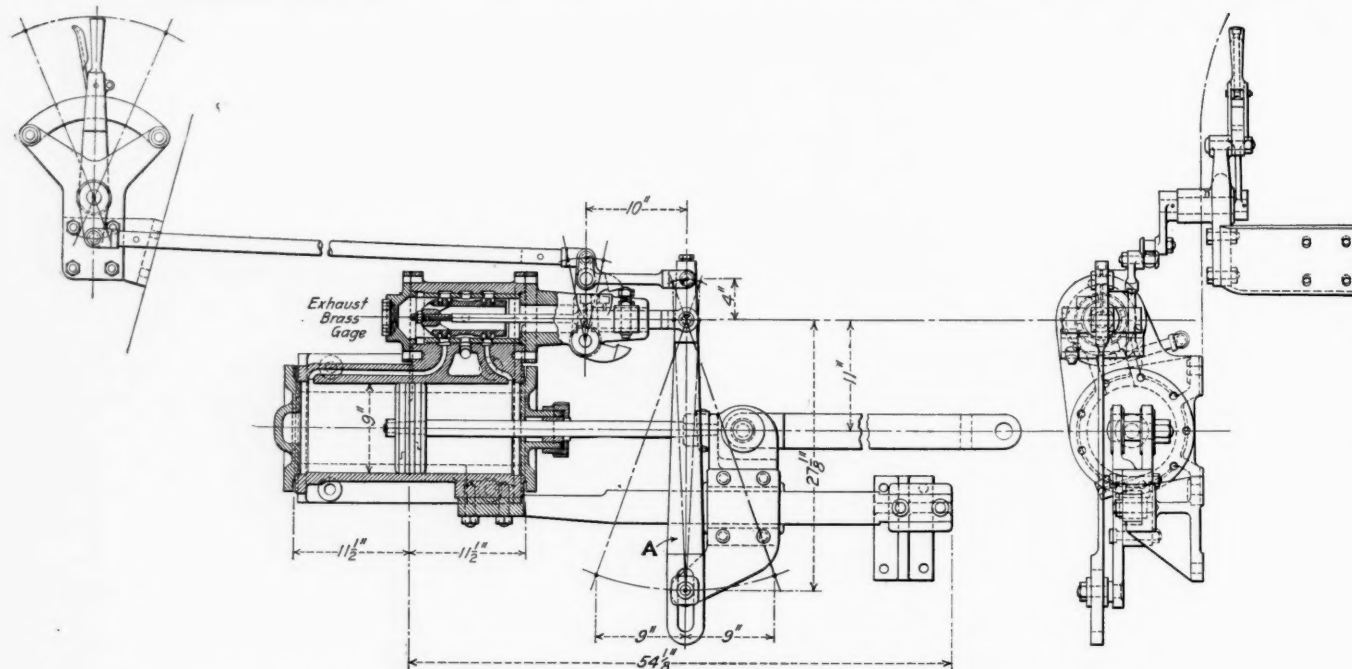
Castings Between Low Pressure Cylinders.

pipe reach rod. The power is applied to a 9-in. piston in the cylinder, whose piston rod is keyed directly to the main reach rod. The operation is exceedingly simple and efficient. The valve is of the piston type, with 1-32-in. inside and $\frac{1}{8}$ -in. outside lap, and designed for an inside admission and has its stem directly connected to a rocking lever A. The lever A is pivoted by means of a slotted hole to the crosshead arm. The operation is as follows:

When the reverse lever is moved to the forward position it

cylinder saddle. When the reversing mechanism is in the central position, this universal joint is directly over the pin connecting the front and rear frames, so that even when at the extreme front or back limits of its throw, the lengthening or shortening of the reach rod due to angularity will be so small as to be a negligible quantity, not great enough to cause any disturbance in the working of the valves.

The oil that is used on these locomotives is rather heavy and has to be warmed before delivery to the burners. This is

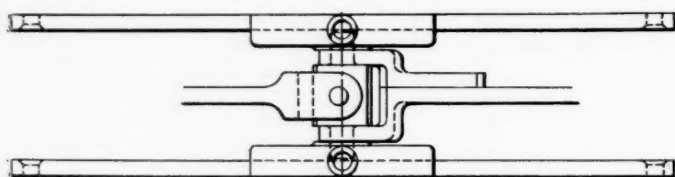


McCarroll Air Reversing Gear; Mallet Articulated Compound for the Southern Pacific.

draws back the lower arm, and with it, also, the upper end of the rocking lever A and the valve of the reversing mechanism. As the valve is of the inside admission type, this movement admits air to the back end of the cylinder and pushes the piston to the front. As the piston moves out and the reverse lever is latched at a notch corresponding to the desired point of cut-off, the rocking lever A is turned about the upper connection and carries the valve stem with it, thus moving the valve also to the front and closing the port. When this has been done, the piston is air locked by a pressure on each side of it. Should it so happen that through leakage or for any other reason the pressure upon one side of the piston is reduced, and there should be a movement in that direction be-

accomplished by means of the steam heater shown. It consists simply of a 3-in. pipe about 7 ft. long, into which steam is admitted. It is capped at each end for the admission of a 1 1/4-in. pipe through which the oil flows, and which is there heated by the surrounding steam.

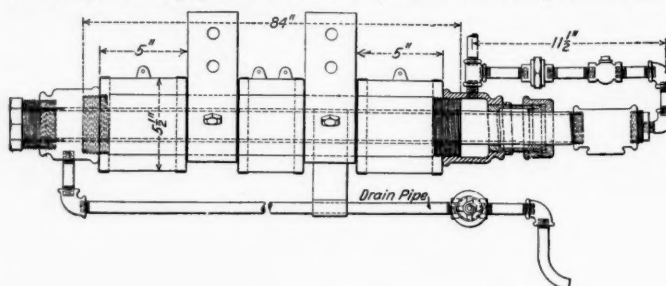
These are the principal features of the engines. The propelling and running gear mechanisms correspond, in general, with standard practice. There is a difference between the high and low-pressure pistons in that the former are of the ordinary box type, with a follower, while the low-pressure are



Universal Joint in Forward Reach Rod.

cause of the pressure on the other place, the valve would also be moved in the same way and, by opening the corresponding port, admit air against the direction of movement and thus push the piston back to where the valve is held in its central position, thus maintaining the cut-off at the point at which it is set by the reverse lever.

For transmitting the motion on from the rear to the front frames and, at the same time, to compensate for the angularity existing between the two when the engine is on a curve, a universal joint is put in the forward reach rod. This joint consists of two sets of trunions at right angles to each other, carried by a crosshead moving in guides in the high-pressure



Steam Heater for Fuel Oil.

of the Z pattern and are solid steel castings with snap rings. It is noticeable, too, that, in spite of the large diameter of the cylinders, especially that of the low-pressure, it has not been considered necessary to use tail rods to carry the weight.

The contract for the extension of the Rhodesian Railway from Broken Hill to Katanga, near the southeast corner of the Congo Free State, has been let to Pauling & Co., who began work in February. The copper mines at Katanga are reported to be extraordinarily rich. The ores will reach the sea, when the road is completed, at Beira, in Portuguese East Africa.

GRAIN HANDLING IN THE UNITED STATES.

BY SAMUEL O. DUNN,

Western Editorial Manager, *Railroad Age Gazette*.

Vastly the major part of the grain grown in the United States has for many years been transported to market in bulk. That is, it has been run directly from the spout of the threshing machine into the farmer's wagon, and then either has been hauled directly to the nearest country elevator or has been shoveled into the farmer's granary and subsequently shoveled out of it into wagons, hauled by the country elevator, loaded from the elevator into a car in bulk, hauled in bulk to the terminal elevator, transferred there in bulk, and finally exported or delivered to the miller in bulk. The practice of handling grain in bulk has for many years prevailed so exclusively in the great grain producing states of the Middle West and of the more easterly states of the Northwest, such as Minnesota and the Dakotas, that the farmers, grain dealers and railway men in that part of the country are almost unacquainted with any other method, and when they hear any other described they are pretty sure to condemn it as slow, expensive and primitive. Nevertheless, an older and different system of grain handling prevails in a large part of the world.

The wheat crop of Argentina, which amounted in 1907 to almost 156,000,000 bushels, was sent to market mainly in sacks. Similarly, the large wheat crop of the states of Oregon, Washington and Idaho, which in 1908 amounted to over 42,500,000 bushels, was moved to market mainly in sacks. Efforts have been made for years to introduce the system of bulk shipment in the Pacific Northwest, but they have been only partially successful. It is evident that there must be some reason for this adherence in a large part of the grain growing world to a method of handling which shippers and railway men elsewhere regard as costly and primitive.

The way in which grain is handled, whether in bulk or in sacks, affects its transportation by rail in various ways. It is apt to effect the rate on grain. It affects the tonnage of it that can be got into a car, and also otherwise affects the cost of rail transportation. It has a relation that is not generally recognized to the subject of car shortage, and to the kind of cars used in handling grain. In view of facts such as the foregoing, it is thought that an article dealing with the two methods of handling grain might not be uninteresting to the readers of this paper in England and elsewhere.

The grain elevator system, which is now one of the most characteristic parts of the machinery of commerce in the United States, has grown up largely in response to the same demand, and has been given its present form largely by the same conditions that have stimulated and shaped the growth of the American railway system, with which it has always been very closely interwoven.

The Chicago Board of Trade was organized in April, 1848. Its object was to establish a point where buyers and sellers of grain could meet to transact their business. At that time wheat was hauled to Chicago in wagons from a radius of 100 miles around and was sold in the Chicago market at 40 cents a bushel. Not only were there no railways to transport it, but roads and even bridges were wanting, and the farmer's profit from his crop, of course, was negligible. The issuance of a charter to the Illinois & Wisconsin Railroad Company in Illinois in 1851 marked the beginning of the development of the so-called "granger railways." The Illinois & Wisconsin is now a part of the Chicago & North Western system. As the various railways pushed out from Chicago the grain dealers in that city sent buyers to the country stations, who were either merely agents for the Chicago merchants or did business on capital furnished by them. In either case the grain bought at the local station was usually purchased either directly or indirectly on the account of the Chicago merchant and shipped to him. No one can say just when or where

the first grain warehouse bearing a resemblance to the modern elevator was built. It can, however, be stated with assurance that in the early days the farmers of the Middle West hauled their grain to the local railway stations in sacks, and that the primitive structure which then served as an elevator had a hopper into which the grain was poured directly from the sack, after which it was elevated by an endless chain of buckets and deposited in bins, from whence it was discharged by gravity into cars on the adjoining tracks, horse power being used for the elevation of the grain. Subsequently, some inventive genius devised a scheme by which the hopper was located in a pit at the bottom of the elevator, and the wagon was driven over it and dumped by gravity. This marked the beginning of the end of the handling of grain in sacks in the middle west.

COUNTRY ELEVATORS.

Elevators built rapidly built at numerous country stations along every line of railway, and were well patronized from the first, because they met the needs of all directly concerned—the farmer, the grain dealer and the railway. By enabling the farmer to deliver grain in bulk they saved him the expense of buying sacks. If his grain came from the field wet, the elevator man had facilities for preventing it from spoiling that no individual farmer could provide. Grain grown in the Middle West, it is said, must sweat somewhere. If it does not sweat in the sack it is apt to sweat in the bin, and if it does not sweat in the bin it is apt to sweat in the flour. The elevator proprietor had facilities for preventing the grain from spoiling by sweating that the farmer did not have. In former years in the Middle West the farmers were all poor and needed to realize cash from their crops as soon as they were harvested. The elevator was not only a facility for transferring grain from the farmer's wagon to the car, but was also a storehouse. The fact that the dealer had a place to keep the grain if the market was unfavorable after he bought it, enabled him to take it as fast as it came in, and then hold it for a good price, a thing that the farmer with his lack of financial resources could not do.

The presence of elevators on its lines was advantageous to the railway. Grain could be accumulated in the elevator until there was several carloads and then poured rapidly into the cars. This made delays to rolling stock less than when the grain was shoveled from the farmer's wagons into cars or was transferred direct from the farmer's wagon to the cars in sacks. There was a time when there was a number of little flat warehouses along the railways in the Middle West, some of them having a capacity as small as 1,000 bushels. It took two, three or even four days to scoop enough grain from one of these to load a car. On the other hand, the ordinary country elevator had a capacity of several thousand bushels; a modern country elevator usually has a capacity of no less than 25,000 bushels; and 10 to 15 cars can be loaded from it daily. Where sack grain is accumulated in flat warehouses before being loaded on cars, the delay which loading it causes to railway equipment is less than the delay that would be caused by shoveling it from a wagon into a car, but it is substantially greater than the time taken to load cars from an elevator. In seasons of heavy railway traffic the elevators afford a place where large quantities of grain can be stored awaiting cars; and therefore, it is contended, the elevator system tends to reduce the congestion of traffic at such times.

TERMINAL ELEVATORS.

What has been said relates mainly to the country elevators. The advantages to the farmer, the shipper and the railway of the terminal elevators at the large markets were early recognized to be equally great. The grain as it came from the farmer in the Middle West often needed to be dried, cleaned, etc., to render it fit for export or for milling. For example, occasionally during a wet season, there is a soft corn crop in Illinois. Corn in this condition cannot be transported far without spoiling. It is necessary to get it as soon as practi-

cable where it can be properly treated, and this usually can be done only in a large terminal elevator, for the country elevators are seldom equipped with machinery for any purpose but the transferring of grain—elevation properly so-called. Of course the existence of facilities for so treating the grain as to keep it from spoiling inures in the long run to the advantage of producer, carrier, grain dealer and consumer.

Usually when grain was bought its ultimate destination was unknown. It is not known whether finally it would be ground into flour at Minneapolis, or St. Louis, or Chicago, or shipped to the Atlantic seaboard, or sent to Europe. The merchant, therefore, needed a place to keep the grain while he was finding a buyer for it. The terminal elevator served this purpose. It was often advantageous to mix a lower grade of grain with a higher grade in order to increase the value of the former, and the elevator was equipped with machinery for this purpose also.

The establishment of terminal elevators on its lines at the large markets was extremely desirable for the railway. When a terminal elevator was built on the lines of one road, the grain moving to that elevator was pretty sure to move over that road, giving it traffic. When the transportation of grain began before its ultimate destination was known, it was pretty sure to have to be held in storage somewhere, and if, after it began to move, it were not held in storage in a terminal warehouse it would have to be held in the railway's cars; and a car can commonly be used to better advantage as a transporter than as a warehouse. A great deal of grain had to be transferred at terminals from cars of one railway to cars of another or to boats on rivers, canals, the Great Lakes and the ocean, and these transfers, of course would be accomplished with least delay to the cars through an elevator. Both the country elevator and the terminal elevator were an advantage to the road in that they enabled it to load its cars to their cubic capacity with the lighter grains, such as oats, which could not be done when grain was shoveled into the car or stowed in it in bags.

Owing to these and other conditions, the railways in the Middle West from the start did all they could to stimulate the development of the elevator system. In some cases they built and operated both country and terminal elevators themselves. In other cases they furnished the capital for the organization of companies which built and operated the elevators. In other cases they built elevators and leased them at low rentals to grain dealers. In still other cases they leased land to private individuals for the construction of elevators at purely nominal rentals—at \$1, \$2 or \$5 per year. Competition between the roads was such that it is believed the instances were few where elevators were built entirely with private capital and ground belonging to railways was leased for what it was worth. The evidence taken by the Interstate Commerce Commission in the so-called Peavey case, which appears in the various reports of the Commission under the title "In the Matter of Allowances to Elevators by the Union Pacific Railroad Company," throws much light on the relations that long have existed and still exist, between the railways, the grain dealers and the elevator operators. This testimony shows that grain is usually bought in the country by the manager of a country elevator. It is weighed, taken into the elevator, and paid for, and the transaction is completed so far as the farmer is concerned. Occasionally the farmer puts his grain into the elevator subject to order for future shipment, or sells to what is known as a "track buyer," in which case the grain is delivered directly from the wagon to the car. The owners of country elevators sometimes have no connection with any terminal elevator, in which case the grain is sold "f. o. b." at the country station and consigned to the owner in care of some commission house at a central market. In most cases, however, the country elevator is one of a string of elevators that is operated by some concern which also operates large terminal elevators and buys and sells grain. Ordinarily such

concerns keep their business as operators of elevators and their business as dealers in grain nominally separate. For example, the Peavey Grain Company runs its elevator at Kansas City, Mo., under the name of the Midland Elevator Company, and its elevator at Council Bluffs, Ia., under the name of the Omaha Elevator Company. Similarly, the Armour Grain Company operates its elevators under the name of the Armour Elevator Company, and it is also pretty well understood that it controls the Neola Elevator Company. Usually a railway works on its line with a single large elevator company. For example, the Peavey Grain Company operates a large number of country elevators on the Union Pacific system and the Rosenbaum Grain Company on the Rock Island and some other roads.

(To be continued.)

THE PASSENGER RATE OF THE AMERICAN RAILWAY.*

BY WILLIAM S. BRONSON,
Assistant General Passenger Agent, Chesapeake & Ohio.

II.

The maximum rate of fare, covered by the first class one way ticket applies primarily to causes that occasion infrequent travel. The second class rate meets the same causes for travel as the maximum rate of fare, the distinction being merely one of accommodations. The immigrant rate meets those causes that occasion immigrant travel, mainly immigration from foreign lands to the United States, and these fares are not available for domestic travel. The round trip rate meets a kind of travel not fitted by lower lesser rates of fare such as mileage, commutation, tourists' and excursion tickets, and each other rate is occasioned by a definite distinction in the needs of the traffic it covers.

It is a maxim that passenger density depends upon the density of the population of the territory served by the railway. This means, in good plain English, that if people do not live on or near the line of a railway, the railway cannot carry them, and it must be apparent even to the layman that in such states as Massachusetts, with 347 people to the square mile, Connecticut with 187 people and Rhode Island, with 407, travel is necessarily greater than in Virginia, with 46 people to the square mile, West Virginia, with 39, and Kentucky, with 54. Yet, as we are dealing with a theory, it is our purpose to establish this theory clearly.

The New York, New Haven & Hartford Railroad, for the year ending June 30, 1906, operating in the above mentioned New England states, under a rate adjustment, which included a three-cent maximum rate, showed a passenger density of 610,416 passengers carried one mile, each mile of railway, at an average rate of 1.6 cents per mile, producing \$10,233 in earnings, and \$1.38 for every mile each passenger train ran. The corresponding report of the Chesapeake & Ohio Railway, operating in the above mentioned southern states, under a rate adjustment which included the same three-cent maximum rate, shows a passenger density of only 110,648 passengers carried one mile each mile of railway, at an average rate of 2.1 cents per mile, producing only \$2,365 in passenger earnings for each mile of road and \$1.17 for every mile each passenger train ran.

As density of population regulates density of travel, so does density of travel regulate the rate, for the average rate obtained by the rate adjustment of the New York, New Haven & Hartford was 1.6 cents per mile, while the average rate obtained by the Chesapeake & Ohio was 2.1 cents per mile. In other words, under a uniform maximum rate, the traveler in the sparsely settled southern states paid one-half cent per mile more for his travel than the traveler in the densely settled New England states. The greater the volume of business, the cheaper the selling price, and the railway operating

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in sparsely settled states can no more carry passengers profitably at the same rate as the railway operating in densely settled states than can the country storekeeper sell his goods at the same price as the city merchant.

If necessity was the only cause for travel, and people could not be induced to travel through habit, for pleasure and recreation, or for business causes through attractive rates of fare, then only one rate would be necessary, although even in that case, the one rate would vary on different railways serving different sections of territory, conforming to the density of population. But as a large proportion of travel is caused by reasons other than necessity, all these matters must be taken into consideration in the adjustment of rates of fare. Primarily, the railway is a common carrier, a public utility. Secondly, it requires the revenue obtained from creative traffic, so that in order to satisfy both public and stockholders, we must provide various rates for various causes for travel.

The maximum one way rate is fixed first. It takes into consideration the density of population of the territory served by the railway, and the fact that business and social conditions and the railway's own welfare require the establishment of many lesser rates. If these two considerations work out a maximum rate, which, based on past experience and the experience of other similarly situated lines, would be so high as to tend to unduly dwarf general travel, the first consideration is to a certain extent disregarded, and after giving due weight to the second consideration, a maximum rate is fixed upon that will bring out a satisfactory general travel, and in connection with various lesser rates will obtain an average rate that will produce satisfactory returns. That the density of population must be disregarded when the maximum rate worked out is too high to fit the causes for travel is clearly illustrated by taking the New York, New Haven & Hartford Railroad as a standard. Based on population, the two-cent maximum rate on that railway is equivalent to a five-cent maximum rate on the Chesapeake & Ohio, in Virginia, West Virginia and Kentucky. Yet a three-cent maximum rate was voluntarily given by the Chesapeake & Ohio, because, regardless of population, this rate combined with various lesser rates produced better results than either a four-cent maximum rate with other lesser rates, or a two-cent maximum rate without the lesser rates. When railways were first established and had no guiding precedents to assist them in adjusting their fares, the charter rates were very naturally charged as the maximum, but these fares were quickly found to be so high as to dwarf travel. After an experience of 75 years the railways in most sections of the United States have found that a three-cent maximum rate, together with various lesser rates, gives the best general results. Too high a maximum rate simply forces people to stay at home, while, on the contrary, too low a maximum rate, which impels the railway to refrain from putting into effect the lesser rates for creative purposes, accomplishes exactly the same result. It is an assured fact that in our sparsely settled country the street car principle will not produce satisfactory results, for without the influence of the lesser rates fitted to the various causes for travel, travel, as a whole, is so dwarfed that no single rate, be it high or low, can produce remunerative returns for the railway.

Although, some years ago, second class fares were quite generally in use throughout the United States, to-day, by reason of the prejudice against class distinctions existing in the minds of the American people, these fares are the exception rather than the rule and it requires no prophet to foretell the end of second class rates of fare in the very near future. The titles now are misnomers, since no second class accommodations are generally provided on our trains, and it is a daily occurrence to find two travelers riding side by side between the same points, one holding a ticket calling for a first class passage, and the other a ticket calling for a second class passage. As a matter of fact, in the near future tickets will

be valid for railway transportation in any car on train, or will read "for one coach passage" when restricted to coach accommodations.

As to the second class rate in cents per mile, the old basis, years ago, seemed to fix the second class rates at about two-thirds of the first class rate. To-day, however, the difference is much less and rarely exceeds a 10 per cent. reduction.

Immigrant rates, effective from important ports of entry only, and not available for domestic purposes, have so little bearing of the rate adjustment that any extended explanation is unnecessary. The reduction under the maximum rate is now so small that the immigrant rate is well up to the average rate obtained from other travel factors.

A distinction is made between round trip rates and excursion rates, the former providing a basis of fares which are always available. Hence they are in the nature of a maximum rate for round trip travel, while the excursion rate, though a round trip rate, is available only during a specified period, and is established to fit temporary causes for travel entirely different from those causes fitted by the round trip rate. Under the general classification of round trip rates we include the so-called regular round trip local rates, which many railways have in effect between all points just as they have the maximum one way rates. In such cases, these rates, while fitting causes for round trip travel, accomplish a separate purpose by reducing the payment of cash fares on trains.

Round trip fares are frequently established at a considerable reduction under double the maximum rate between commercial centers reasonably distant and between commercial centers and adjoining country districts where existing causes for round trip travel warrant a rate that will bring out the travel. Illustrative of the first instance is the New York and Washington situation, where the one-way rate for years stood at \$6.50 as against a \$10 round trip rate, both voluntary rates, and each serving a distinct purpose. Yet, with these fares in effect, mileage rates of \$4.52 one way and \$9.04 round trip were also effective. Illustrative of the second instance, is the Richmond, Va., situation. Round trip rates from adjacent territory to Richmond were effective at a reduction of 20 per cent. under double the maximum rates.

The mileage rate being a lesser rate can be adjusted to much greater nicety than can the maximum rate, which, as before explained, cannot be fixed so high as to unduly dwarf general travel regardless either of population or of remunerativeness, while the mileage rate can be regulated to a great extent by density of population, and is always fixed at a figure presumably remunerative. In fixing commutation fares, however, a monthly rate of fare based on any ordinary rate per mile in cents would be prohibitive and would utterly fail to fit this cause for travel. Hence it is necessary to fix upon a rate per mile that multiplied by 60 (the number of trips comprising a monthly ticket) will give a monthly rate that will enable business to move. This rate averages about 7 mills per mile with a minimum monthly rate of \$2.50, so that the commuter living ten miles out of the city and traveling 600 miles monthly pays \$4.20. If he lives 25 miles outside the city and traveling 1,500 miles monthly, he pays about \$10.50. School tickets are sold at even a lower rate per mile, while family tickets are higher.

Within the last year many lines have withdrawn their party rates entirely rather than suffer the loss in revenue believed to be involved in opening up the rate to public use, as was required by the Interstate Commerce Commission. More than half of the railways of the country now have no party fares in effect, and such causes for travel as theatrical and amusement interests are not fitted by a rate of fare so that business interests that cannot afford to pay the maximum rate are forced out of business. On lines where the rate is in force the tendency is towards a party rate of 2 cents a mile, it having been pretty conclusively demonstrated that any less rate falls to encourage travel sufficiently to justify the greater

reduction, while any rate over 2 cents is a misfit and destroys the causes that occasion the travel. Possibly the Far West, with its small density of travel, can afford a 2½-cent rate.

The generally accepted basis for tourist fares is 80 per cent. of double the maximum, and they are rarely permitted to disturb rates between large commercial points where the volume of travel for regular causes is so much greater than the special traffic that tourist fares would result in loss in revenue rather than an encouragement to earnings. Excursion rates, however, given for conventions, meetings and gatherings, social and business, are temporary and vary from 1½ to 1 cent per mile, sentiment somewhat affecting these rates, as in the case of the G. A. R. and Confederate Veterans. Meetings of business concerns which find it advantageous to exchange views usually are given a temporary rate from 2 to 1½ cents per mile, and fairs, state and country, get the same.

For the recent Jamestown Exposition four separate and distinct rates of fare were fixed, to apply during the period as follows:

- Season limit: 80 per cent. of double the maximum rate.
- Sixty-day limit: One and one-third fare, approximately equivalent to two cents per mile.
- Fifteen-day limit: One fare plus \$2, approximately equivalent to one and one-half cents per mile.
- Ten-day limit: One cent per mile, restricted to coach accommodations.

Many lines traversing sparsely settled sections believe that the demands for holiday travel can be met only by fitting thereto a temporary rate of fare from 2 to 1½ cents per mile.

Cheap excursion travel comprises principally wage earners who travel preferably on holidays and Sundays for recreation and pleasure. To meet these causes for travel a very low rate must be made. Otherwise the travel will promptly disappear. We may say, in general, that any such rate exceeding 1 cent per mile is a misfit and in many cases, dependent upon local needs, even a lower rate is necessary.

In fixing these rates we consider the circumstances and interest surrounding the cause for travel, well knowing that these travel causes are at best precarious and cannot be met by any ordinary rate. In many cases it is necessary to create the cause for travel by a rate low enough to accomplish its purpose, and even then the time must be opportune, for there are certain times when no rate, however low, will create travel. Assuming a rate fixed it is well understood that this business, if profitable at all, is so only in train-load lots, and even then much of it barely shows the proper insurance percentage, for the loss of one accident might wipe out a whole year's earnings derived from this travel factor. But as it is the policy of many lines to meet existing causes for travel or create new causes by the necessary rates, such lines take this business chance whenever they see the opportunity of conducting a profitable excursion, first expense alone being considered, that is, the cost of advertising and train service.

An important feature of travel which greatly complicates the rate adjustment is the fact that fares designed to meet various causes for travel can only in exceptional instances be confined to the particular cause for which they are designed. Rates in general are open to public use, and as there are no tickets to enforce class distinction in persons, each lower rate of fare interferes more or less with each higher rate of fare. The man whose business causes extensive travel, to which a mileage rate is fitted, cannot be compelled to use the mileage rate if a lower suitable rate happens to be available. Let an excursion rate be put in effect that meets his wants and he immediately avails himself of this lower rate. Hence it is very necessary that the most careful consideration be given surrounding circumstances and conditions, particularly in the case of temporary rates, for unless the rate reasonably fits the cause for travel it is certain that the loss in revenue occasioned by the use of the lower rate by individuals whose travel is not directly sought will unduly

lessen the average, the loss exceeding the gain. If the maximum one way rate from St. Louis to Indianapolis were \$7.50 and there were no special attraction at Indianapolis to induce travel, an excursion rate of \$5 would not produce the revenue necessary to overcome the loss occasioned by the use of the \$5 rate by the traveler who otherwise would have paid \$7.50. But if the G. A. R. Encampment is held in Indianapolis it is reasonably certain that the \$5 excursion rate will be profitable, for in that case the cause would induce so heavy an additional *bona fide* excursion travel that the additional revenue produced by the \$5 rate would be much in excess of the loss occasioned by the use of the \$5 ticket as above described.

In fixing in dollars and cents rates to fit the various causes for travel, exercise of the utmost care is required. Unless due consideration is given the loss occasioned by a sure but varying and uncertain percentage of travel, using lower rates in lieu of the higher rates established to fit their cases, the revenues as a whole will be non-remunerative. This explains why railways traversing sparsely settled sections operating under involuntary low maximum rates are utterly unable from a revenue viewpoint to establish special rates. The maximum rate must act as the regulator to the entire adjustment, and it cannot perform its important functions unless it is fixed at a figure sufficient to support its proper percentage of loss. Each lesser rate, in turn, has the same responsibility, and where the regulator in the form of the maximum rate is fixed too low the whole rate fabric is disarranged and many of the lesser rates established under a proper rate adjustment to meet social and business conditions must from sheer necessity disappear. Then the railway is compelled, in self protection, to rely almost entirely upon the revenue produced by the maximum rate, while the absence of a suitable rate for the traveler means an empty seat, and a would-be traveler converted into a stay-at-home to the disadvantage of all parties.

It is a safe assertion that too low a maximum rate is nearly as injurious to the public as too high a maximum rate. There is just about as much business sense in operating a railway traveling a sparsely settled country, needing every dollar it can earn, at too low a maximum rate, as in running a large department store without bargains and sales. In fixing the price for one kind of merchandise due consideration must necessarily be given to the prices fixed for other kinds, especially for staple articles or articles which during certain periods may be considered staple but may afterwards be changed to bargain articles. If the margin of profit on staples is reduced the case of the railway operating under too low a maximum rate is well paralleled. The railway can then no more afford to offer bargains in tickets than the department store can afford to sell dry goods below cost.

Thus it is evident that passenger rate adjustment is a most delicate matter. In fixing many of the lesser rates, such as excursion rates, no consideration can be given to other than the expense of creating and moving the particular traffic for which the rate applies, yet the whole passenger rate fabric must do much more than this. The working of the passenger rate adjustment can be likened to a clock, with the maximum rate as the regulator and the mileage rate as the pendulum, and it must be predicated on the population of the territory served in the effort to obtain an average rate which, multiplied by the number of miles of travel obtained from all causes for travel, will produce remunerative returns.

According to a Chinese newspaper, the Dalai Lama of Tibet is reported to have requested the Chinese government to allow him to float a foreign loan for the construction of a railway from Chumi, British India, to Lhasa, Tibet, and for the development of the mines along the route of the railway. It is believed in Peking that the proposal will be sanctioned by the Chinese government.

CHICAGO TRACK ELEVATION.*

BY M. K. TRUMBULL,
Engineer of Track Elevation.

The city of Chicago has maintained a track elevation policy for almost one-fourth of its corporate existence. The annual growth of track elevation has been consistent and the cumula-

*From a report of more than 1,000 pages, covering the Chicago track elevation in careful detail. In addition to the above discussion, the volume contains a list of the original ordinances, arranged chronologically, with indexes and reprints of the same, besides much other listed information, and plates, maps, etc.

tive result is remarkable. The railways have executed mile after mile of this kind of construction with scarcely a word from public or press. Scarcely a train has been delayed, and the passengers are lifted almost while they ride.

With a congested right-of-way to begin with, the railway must rebuild from below the ground up and handle its traffic without delay at the same time. The commissioner of public works permits the blocking of but three or four consecutive streets at any one time. Two miles of track elevation, for instance, must be divided into from four to five separate sec-



Progress of Chicago Track Elevation.

tions, in each of which the operations are separate and distinct. The object of this program is to offer the minimum of obstruction to street travel; especially to surface cars and the city fire department. The restriction upon the railways increases the cost of work, complicates the handling of trains and lengthens the time to complete the work. Upon consideration of the many complications involved one wonders at the dispatch with which the work is accomplished.

Track elevation, properly speaking, began on May 23, 1892, when the Illinois Central secured from the city council an ordinance for the elevation of its tracks from 51st street to 67th street. An urgent necessity confronted the Illinois

scheme of construction expense. The administration thereupon made a survey of those zones in which the street crossing travel was most dense and decided to treat each zone separately, and, where necessary, to further sub-divide each into elements of reasonable length.

Seventy-four per cent. of the work, for which ordinances have been passed, has been completed. The 148.72 miles of railway roadbed already covered by track elevation ordinances is approximately 44 per cent. of the total mileage of roadbed within the city limits. Basing an estimate on this percentage the ultimate cost of track elevation will approximate \$150,000,000, assuming: (1) That the city limits remain as they are

TABLE I.—TRACK ELEVATION COMPLETED OR PROVIDED FOR BY ORDINANCE TO DECEMBER 31, 1908.

RAILROADS	MILEAGE		SUBWAYS																COST
			INDIVIDUAL SUBWAYS								JOINT SUBWAYS								
	Miles of Roadbed out to out of Ex- treme Subways	Miles of all Tracks out to out of Extreme Sub- ways	GENERAL SUBWAYS			Foot Passageways	Alleys	Separation of Railroad Grade Crossings pro- vided for	Subways Constructed by Private Contract	Total Individual Sub- ways	GENERAL SUBWAYS			Foot Passageways	Separation of Railroad Grade Crossings pro- vided for	Subways Constructed by Private Contract	Total Joint Subways	Total All Subways	
			Roadway Grade Cross- ings abolished and Subways provided for	Viaducts removed and Subways provided for	Subways to be con- structed when City opens Streets						Roadway Grade Cross- ings abolished and Subways provided for	Viaducts removed and Subways provided for	Subways to be con- structed when City opens Streets						
A. T. & S. F. Ry.....	3.85	7.21	1	0	0	0	0	0	0	1	20	0	1	0	0	1	22	23	\$ 710,000
B. & O. R. R.....	1.53	5.04	0	0	0	0	0	0	0	0	10	0	0	0	0	0	10	10	1,500,000
C. B. & Q. R. R.....	6.91	55.09	21	0	0	0	0	0	1	22	18	3	0	0	0	0	21	43	4,150,000
C. J. Ry. including { Burton Stock Car Co. { Canda Cattle Car Co. { Street's Western Stable Car Co.	5.87	17.99	25	1	0	0	3	1	0	30	25	1	0	1	0	0	27	57	1,710,000
C. M. & St. P. Ry.....	7.53	62.27	39	1	3	2	0	0	0	45	1	1	0	0	0	0	2	47	4,550,000
C. R. I. & P. Ry.....	12.80	52.60	32	0	1	4	0	0	0	37	44	1	0	0	1	0	46	83	2,903,000
C. T. T. R. R.....	9.17	33.77	18	0	0	0	0	0	0	18	37	5	0	1	0	0	43	61	4,650,000
C. & A. R. R.....	3.55	14.47	17	0	0	0	0	0	0	17	17	0	0	0	0	1	18	35	900,000
C. & I. W. R. R.....	0.92	1.84	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	2,000,000
C. & N. W. Ry.....	30.54	205.85	154	0	3	5	14	0	0	176	42	6	1	0	0	0	49	225	13,778,000
C. & S. E. R. R.....	1.39	1.80	0	0	0	0	0	0	0	0	10	0	0	0	0	0	10	10	130,000
C. & W. I. R. R.....	16.71	186.12	57	0	0	2	0	2	3	64	50	1	2	0	1	0	54	118	13,000,000
G. T. W. Ry.....	2.27	5.70	0	0	0	0	0	0	0	0	24	0	0	0	1*	0	25	25	732,000
I. C. R. R.: Main Line.....	3.58	28.34	18	0	0	1	0	1	0	20	4	0	0	0	0	0	4	24	3,090,000
C. M. & N. R. R.....	3.85	7.21	1	0	0	0	0	0	0	1	20	0	1	0	0	1	22	23	
So. Chicago R. R.....	0.53	1.34	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	4	
St. Charles Air Line.....	0.73	2.08	6	0	0	0	3	1	0	10	0	0	0	0	1	0	1	11	
I. H. B. R. R.....	1.05	2.10	0	0	0	0	0	0	0	0	21	0	0	0	1*	0	22	22	200,000
L. S. & M. S. Ry.....	13.33	98.20	0	0	0	0	0	0	0	0	65	1	1	0	3	0	70	70	6,000,000
N. Y. C. & St. L. R. R.....	0.80	1.50	0	0	0	0	0	0	0	0	5	0	0	0	0	0	5	5	850,000
P. C. C. & St. L. Ry.....	8.19	38.15	9	0	0	1	0	0	0	10	48	3	0	1	0	0	52	62	4,340,000
P. F. W. & C. Ry.....	12.01	81.01	16	0	0	0	0	0	0	16	56	1	2	0	3	0	62	78	7,074,000
Wabash R. R.....	1.61	5.33	0	0	0	0	0	0	0	0	11	0	0	0	0	0	11	11	350,000
Totals.....	148.72	915.01	418	2	7	15	20	6	3	471	532	23	8	3	11	3	580	1051	\$72,622,000

*Temporary. Note.—Railroad grade crossing separations arbitrarily credited to the overhead roads.

Central officials to make some quick and radical moves in order to place themselves in a position to handle the heavy passenger traffic at the opening of the World's Fair the following season. The population of Chicago at that time was 1,200,000. A crying need for relief at a great number of grade crossings, where the railways were annually killing and injuring many people, was felt. A few cases had been disposed of at important streets by constructing viaducts over the tracks to accommodate the street travel. The viaduct policy had, however, become unpopular. The height at which it was necessary to erect the viaducts, above the original grade of streets, required the construction of long approaches, not only in the streets provided with viaducts, but in those that intersected the site of the approaches as well. Then, as necessity arose, nearby streets were selected for viaducts. The logical result threatened that the zones of city property contiguous to the railways were soon to be enmeshed in a network of approaches which would not only offer long and heavy grades to street traffic but would considerably depreciate the value of the property affected.

The track elevation idea was eagerly grasped by the city administration, and on February 23, 1893, it passed a general ordinance which provided for the elimination of all grade crossings in the city by track elevation.

The railways, however, declined to enter into the wholesale

at present; (2) that the growth of population will require all tracks to be elevated within these limits; (3) that the cost per mile of roadbed will be 80 per cent. of that already provided for, on the theory that there will be fewer tracks per mile of roadbed. This estimate, however, looks so far into the

TABLE II.—Classification of Subways, Each Joint Subway Counted but Once.

Subways constructed by railways.	Completed.	Under construction.	No work done.	Subways to be constructed when city opens streets.	Total.
General subways:					
Roadway grade crossings abolished, subways provided	432	82	134	10	658
Viaducts removed and subways provided for.....	10	0	1	0	11
Foot passageway subways.	10	0	6	0	16
Alley subways.....	7	6	7	0	20
Ry. grade crsgs separated.	6	2*	3	0	11*
Subways constructed by private contract.....	4	0	0	0	4
Totals.....	469	90	151	10	720
Independent subways:†					
Across streets.....	12	3	4	0	19
Across alleys.....	4	0	1	0	5
Totals.....	16	3	5	0	24
Total, all subways....	485	93	156	10	744

*One of these is temporary.

†Constructed by industries.—Subway bridges carrying industry tracks immediately adjacent to bridges of the railway not included in above.

future that any one or more of these assumptions may be found to be without foundation.

There are 744 subways, averaging seven to the mile of road-bed elevated, classified in Table II., considering as a single subway each case where two or more roads have elevated their adjacent roadbeds and have participated in the expense of constructing the joint subway.

In some cases negotiations between the city and the railway officers have consumed much time; but the average period has been short. The situation is parallel with negotiations preliminary to contracts of any character. As soon as the ordinances have been passed, approved and accepted, the railways have executed their part of the agreements in good faith. In numerous cases they have even gone further and have performed work not called for in the ordinances, either upon their own initiative or upon the request of the city officials. This brought about better feeling between the city and the railways than existed a decade or two ago.

The officers of the railways take personal interest in their work, with the result that the appearance and efficiency of their designs are steadily improving. Their efforts are in-

two generations on the basis of a total expenditure of \$150,000,000.

Another result is the saving of time that would be lost annually in case no tracks had been elevated. During 1908 there were recorded 643,386,000 rides on the surface lines alone. Most of the railways intersect street car tracks every half mile where the city is built up and where surface traffic is heaviest. It is fair to assume that 150,000,000 of these rides encountered railway tracks or subways. If track elevation had not been accomplished, passengers would have suffered many delays, due to crossings being blocked. Assuming that each passenger trip of the 150,000,000 would have been delayed an average of one minute and that 90,000,000 pedestrian trips would have been obstructed a like amount, 4,000,000 hours time would have been lost. The street cars themselves would show decreased operating revenue. When the delay to teams, carriages and automobiles is also considered, a conservative estimate of the value of time lost would approximate \$1,500,000 per year.

The reduction in annual fire losses due to track elevation is difficult to compute. The delay to the fire department in reach-

TABLE III.—DECREASE IN GRADE CROSSING ACCIDENTS.

YEAR	POPULATION	DEATHS ALL CAUSES		GRADE CROSSING ACCIDENTS						
		Number	Rate Per 1,000	FATAL			NON-FATAL		TOTAL	
				Number	Rate Per 1,000,000	Percentage of Death All Causes	Number	Rate Per 1,000,000	Number	Rate Per 1,000,000
1899	1,626,333	25,503	15.7	113	69	0.44 per cent.	169	104	282	173
1900	1,698,575	24,941	14.7	97	57	0.39 " "	105	62	202	119
1901	1,757,010	24,406	13.9	64	36	0.26 " "	91	52	155	88
1902	1,815,445	26,455	14.6	61	34	0.23 " "	122	67	183	101
1903	1,873,880	28,914	15.4	69	37	0.24 " "	169	90	238	127
1904	1,932,315	26,311	13.6	55	29	0.21 " "	172	89	227	118
1905	1,990,750	27,212	13.7	99	50	0.36 " "	48	24	147	74
1906	2,049,185	29,048	14.2	68	33	0.23 " "	65	32	133	65
1907	2,107,620	32,143	15.2	38	18	0.12 " "	62	29	100	47
1908	2,166,055	30,548	14.1	20	9	0.07 " "	27	12	47	21
Average 10 Years			14.5		37	.026 per cent.		56		93

spired by the desire to produce permanent structures upon which the annual maintenance cost will be low. The railways made their designs ten or twelve years ago in the light of what was then deemed best. To-day shows the result of study and a desire to improve.

The benefits from track elevation are so many that it is difficult to describe them briefly. First and foremost is the manifest reduction in grade crossing fatalities and injuries. Table III speaks for itself, and no words can be more convincing when arguing in favor of track elevation.

This record takes no account of the accidents which occurred on the railway rights-of-way between streets. It is a grade crossing record only. Prior to 1899, 35 miles of railway roadbed had been elevated and 135 subways had been constructed. This work, comprising about 30 per cent. of what has been completed to date, saved many lives and many accidents.

An estimate based on the data in Table III would indicate that track elevation has prevented to date about 1,380 grade crossing fatalities and about 2,510 non-fatal accidents. How many more it has prevented between streets would be difficult to determine. There is now little temptation for boys to "hitch," and for other trespassers to climb upon the railway tracks which are elevated. On the basis of the \$53,622,000 already spent, each grade crossing accident, prevented to date, has been affected at an expense of \$13,800. The outlay for track elevation, spread over a period of years in the future, shows a material reduction for each estimated accident prevented, so that the \$13,800 will become less than \$3,000 within

ing conflagrations is enormous when railway crossing gates are closed for passenger or freight trains.

Some additional benefits due to track elevation are:

1. New districts are opened for settlement, thus reducing local congestion in population.
2. Accessibility to churches, markets and schools is improved.
3. Courts have fewer cases due to trespass, "hitching," car thieving, etc.
4. Few streets are now crossed by railway yards. Twenty-one yards have been elevated to date.
5. Better time is made by trains; fewer accidents occur for which the public has to suffer and for which the railways have to pay; railway rights-of-way are more clearly defined; freight trains do not have to be cut at street intersections.
6. Underground pipes and conduits are more accessible in subways than when lying directly under the tracks where the latter have not been elevated. Breakages of pipes and conduits due to the impact of heavy track loads are eliminated.
7. Improvements, such as new station buildings, new team yards, new freight houses, etc., are secured. In fact, within the limits of track elevation, the railways are entirely rebuilt and are reconstructed along strictly modern lines.
8. Future electrification of railways is made easier, in that the third rail and return circuits can be more easily arranged.
9. Nine unsightly viaducts have been removed. An additional viaduct will be removed this year. Only three, away from the river, will remain after this year.
10. Seven railway grade crossings have been separated. One more has been temporarily separated. Three additional cases will be disposed of under existing ordinances with the probability that two more will be agreed upon by the railways before all the ordinances now in effect have been executed.

The writer has secured data from the different companies as to their subway designs, and has assembled the in-

formation in Table V. The number of subways shown in Table V does not check with the contents of Table I, nor with the classification of subways in Table II. The discrepancy with Table II is explained by the fact that in Tables I and V each joint subway has been counted as many times as there were railways participating in its construction. In Table II each subway has been considered as a single unit, whether in-

TABLE IV.—Cost of Track Elevation to the City of Chicago.

Department expenses to date.....	\$66,084	Per ct.	0.09
Damages paid to date:			
At 10 streets; viaducts were removed.....	\$256,151		
At 709 streets; no viaducts existed..	105,108		
	361,259	0.50	
Total paid out of city treasury to date..	\$427,343	0.59	
Paid into city treasury, acc't track elevation...	280,000	0.39	
Net cost to city to date	\$147,343	0.20	
Est. damages yet to be paid on account track elevation ordinances to date.....	\$350,000	0.48	
Plus above	361,259		
Total est. to be paid out of city treasury*	\$711,259	0.98	
Plus above	66,084		
Total est. to be paid out of city treasury†	\$777,343	1.07	
Less above	280,000		
Net estimated cost to city.....	\$497,343	0.68	

*For damages, account of track elevation ordinances to date.
†Including department expenses, account of track elevation ordinances to date.

extend the toe to add greater resistance to overturning. The soil is soft and some settlement results, except where caissons are sunk in bed rock. To prevent the percolation of water through the walls and abutments some roads coat the back with asphalt or pitch. Some employ longitudinal drainage either 4 or 5 ft. below the elevated track level or at the original grade of the tracks. Some use weep holes.

In the early years, almost all work was done by hand, to-day nearly all heavy work is performed by machinery. The rate of progress is thereby accelerated and a more uniform daily output assured. Even with machinery, track elevation gives employment to about 5,000 men annually in Chicago.

The policy of the present administration has been, and is, to provide 13 ft. 6 in. headroom at all streets where surface lines exist or are probable, and 12 ft. at all others. A smaller amount of depression of the streets is being allowed the railways. At least eight subways are to be provided for each mile of elevation. A more careful consideration of all the many factors is being made than heretofore.

Strictly speaking, the authority of the track elevation department ceases in any piece of track elevation as soon as the filing plans, submitted by the railways as their interpretation of the provisions of the ordinance, are approved. At this stage the authority of the commissioner of public works begins. He issues all permits, passes on the program of the work and in-

TABLE V.—TYPES OF SUBWAYS.

RAILROADS	ROWS OF COLUMNS					TYPE OF BRIDGES						TYPE OF FLOOR SYSTEM						TYPE OF DECKING					TYPE OF WATERPROOFING					BAL- LASTED					
	Clear Span	1 Row	2 Rows	3 Rows	More than 3 Rows	I	II	III	IV	V	VI	I	II	III	IV	V	VI	No Decking	I	II	III	IV	V	No Water-proofing	I	II	III	IV	V	YES	NO		
A. T. & S. Fe Ry.	17	1	2	2	0	17	4	1	0	0	0	18	1	0	0	0	3	3	3	0	19	0	0	0	3	19	0	0	0	0	19	3	
C. B. & Q. R. R.	12	1	3	20	0	12	5	0	0	16	3	0	17	0	0	0	16	3	0	16	0	16	1	3	5	16	1	0	14	0	20	16	
C. J. Ry.	20	0	10	9	0	19	13	7	0	0	1	8	24	7	0	0	1	1	1	5	2	0	29	3	8	3	1	1	0	27	37	3	
C. M. & St. P. Ry.	20	1	16	3	0	6	33	0	0	0	1	0	39	0	0	0	1	0	34	1	4	0	1	0	0	0	0	0	0	40	5	35	
C. R. I. & P. Ry.	37	3	8	3	0	39	8	3	0	0	0	3	44	0	0	0	3	0	50	0	0	0	0	0	50	0	0	0	0	0	0	50	
C. T. T. R. R.	6	0	3	32	1	5	5	0	30	0	2	1	5	1	0	20	0	5	0	1	0	0	39	1	0	1	32	7	0	1	40	1	
C. & A. R. Ry.	17	3	12	3	0	16	18	1	0	0	0	0	35	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	33	2	
C. & N. W. Ry.	49	3	53	101	0	35	70	5	82	0	14	3	110	5	82	0	5	0	0	0	35	0	0	0	35	0	0	0	0	0	57	112	94
C. & W. I. R. R.	30	3	10	26	0	30	7	26	0	0	6	0	31	27	0	0	11	2	0	0	20	36	1	9	11	1	0	94	47	0	58	11	
G. T. W. Ry.	9	1	13	1	0	0	23	0	0	0	1	0	23	0	0	0	1	0	0	0	24	0	1	0	0	0	0	0	0	24	54	1*	
I. C. R. R., including: C. M. & N. R. R. St. Charles Air Line	22	0	22	11	1	20	26	1	0	8	1	14	29	1	0	8	4	5	9	19	0	0	23	29	19	0	0	0	0	8	27	29	
I. H. B. R. R.	20	0	0	1	0	20	1	0	0	0	1*	0	21	0	0	0	1*	0	0	0	21	0	1*	0	0	0	0	0	0	21	21	1*	
L. S. & M. S. Ry.	26	1	5	11	0	26	6	11	0	0	0	3	29	11	0	0	0	2	37	0	4	0	0	0	4	35	4	0	0	0	4	39	
P. C. C. & St. L. Ry.	27	1	6	9	1	27	7	0	9	0	1	12	16	0	0	0	16	0	0	19	13	0	10	2	0	0	26	0	13	5	23	21	
P. F. W. & C. Ry.	12	2	10	35	0	11	2	2	34	0	10	2	18	2	33	0	4	0	0	0	0	0	59	0	0	15	0	3	41	0	59	0	
Percentage of total units.	324	20	173	265	4	283	226	57	155	24	41	68	43	53	115	24	57	13	278	109	105	235	45	26	265	159	103	20	115	183	482	304	
Total units.	41.4	2.5	22.0	33.6	0.5	35.9	28.7	7.2	19.7	3.0	5.5	8.6	55.7	6.7	18.5	3.0	7.5	1.6	35.4	13.8	13.4	29.8	6.0	26.0	20.2	13.1	2.6	14.6	23.5	61	238.8		

*Temporary.

LEGEND.

TYPE OF BRIDGE:

- Type I —Clear girder spans.
- II —Girder spans with columns.
- III —Deck "I" beam spans with columns.
- IV —Deck "trough" spans with columns.
- V —Reinforced concrete slab spans with columns.
- VI —Other designs.

TYPE OF FLOOR SYSTEM:

- Type I —"Troughs" normal to the girders.
- II —"I" beams normal to the girders.
- III —Deck "I" beam spans.
- IV —Deck "trough" spans.
- V —Reinforced concrete slab spans.
- VI —Other designs.

TYPE OF DECKING:

- Type I —Steel plate (flat or buckled).
- II —Creosoted timber.
- III —Reinforced concrete slab.
- IV —Concrete surrounding "I" beams or imbedded in troughs.
- V —Other designs.

TYPE OF WATERPROOFING:

- Type I —Pitch or asphalt coating.
- II —Pitch or asphalt mastic.
- III —Burial or felt mopped with pitch or asphalt, without protection of any description on top of waterproofing medium.
- IV —Same as III but protected by creosoted plank, brick, concrete or mastic.
- V —Other designs.

dividual or joint. The discrepancy between Table V and Table I is due to the fact that some roads made no detailed report for unfinished work, while others anticipated their construction by advising as to what design would be used.

In the early years of track elevation the use of cut stone and rubble masonry was general, but to-day concrete is used exclusively. The soil in and about Chicago is not the best for foundations. Few of the roads place the bottom of foundations more than 1 ft. below the frost line. Two companies use caissons for column foundations. Of those companies constructing foundations only a trifle below frost line, some drive piling under the toes of the retaining walls and abutments. Others

spects all materials and workmanship. As a matter of fact, however, the track elevation department co-operates with the commissioner of public works during the progress of construction and not only consults with the latter, when called upon for advice, but follows each piece of track elevation from start to finish.

RECAPITULATION.—Mileage Elevated, Subways Constructed and Cost.

Items.	Work completed or under construction.	Work under ordinances but not begun.	Totals.
Miles of roadbed	113.44	35.28	148.72
Miles of all track	748.72	166.29	915.01
Subways	559	161	720
Cost	\$53,662,000	\$19,000,000	\$72,622,000

General News Section.

At Kingston, N. Y., June 1, Justice Betts, of the Supreme Court of the state, refused to restrain the enforcement of the state law requiring railways to pay their employees twice a month.

Count Zeppelin, in his new dirigible balloon, Zeppelin II., flew about 900 miles on May 30 and 31, being in the air continuously for about 38 hours. In landing to get more gasoline, the wind drove the balloon against a tree and it was partially wrecked.

At Galveston, May 26, a barge of the Gulf & Interstate Railroad, carrying a passenger train and 40 passengers, was blown by a strong wind out to sea about seven miles. The barge, which was being towed by a tug, became unmanageable. The reports indicate that it was driven by the wind on to the beach, but that no persons were seriously injured, and the passengers were taken off by the life-saving crew.

Governor Hughes, of New York, acting on bills which were left in his hands at the adjournment of the legislature a month ago, has vetoed a large number. One of these is the bill putting into effect the consolidated railway laws, as drafted by the special commission. The Governor says that his action in this case is due to the fact that the consolidated statutes perpetuate an old section, which would prevent the Public Service Commission from reducing passenger fares below 3 cents a mile, except where the carrier earns more than 10 per cent. a year. As this 10 per cent. would be based on the total capital, including low-rate bonds, the law would prevent reduction of rates in some cases of 12 or 15 per cent. on stock. Following this action the Governor refused to sign a law changing the powers of the Public Service Commission relative to the issuance of stocks and bonds. This subject should receive further consideration from the legislature. The Governor signed the bill of Mr. Parker, allowing the Public Service Commission, under certain circumstances, to authorize the abandonment of unnecessary parallel railways.

The First Electric Locomotive.

J. A. F. Aspinall, President of the Institution of Mechanical Engineers, quotes from the *Edinburgh Journal* the following description, which appeared originally in the *London Times* Dec. 10, 1842.

A trial of this very ingenious machine, constructed by Mr. Davidson, was made last month on the Edinburgh & Glasgow Railway, in presence of a number of gentlemen, many of whom are eminent for their scientific knowledge. The carriage was impelled along the railway about a mile and a half, and traveled at the rate of upwards of four miles an hour, a rate which might be increased by giving greater power to the batteries and enlarging the diameter of the wheels. We understand that the carriage was built at the expense of the railway company, and we cannot but congratulate them in having the discernment to employ Mr. Davidson, a gentleman of much practical knowledge and talent, to whose genius great discoveries have been made in electro-magnetism, by whom the carriage was projected, and to whose unwearied exertions the practicability of the scheme is almost placed beyond a doubt.

The dimensions of the carriage are 16 ft. long by 7 ft. wide, and it is propelled by eight powerful electro-magnets. The carriage is supported by four wheels of 3 ft. diameter. On each of the two axles there is a wooden cylinder, on which are fastened three bars of iron at equal distances from each other and extending from end to the end of the cylinder. On each side of the cylinder and resting on the carriage there are two powerful electro-magnets. When the first bar on the cylinder has passed the faces of two of these magnets, the current of galvanism is then let on to the other two magnets. They immediately pull the second bar until it comes opposite them. The current is then cut off from these two magnets,

and is let on to the other two. Again they pull the third bar until it comes opposite, and so on—the current of galvanism being always cut off from the one pair of magnets when it is let on to the other.

The manner in which the current is cut off and let on is simply this: At each end of the axles there is a small wooden cylinder, one-half of which is covered by a hoop of copper; the other is divided alternately with copper and wood (three parts of wood and three of copper). One end of the coil of wire which surrounds the four electro-magnets presses on one of these cylinders, on the part which is divided with copper and wood; the other end of the coil presses on the other cylinder in the same manner. One end of the wires or conductors which comes from the battery presses constantly on the undivided part of the copper on each cylinder. When one of the iron bars on the wooden cylinder has passed the faces of two magnets, the current of galvanism is let on to the other two magnets by one end of the coil which surrounds the magnets passing from the wood to the copper, and thereby forming a connection with the battery. This wire continues to press on the copper until the iron bar has come opposite the faces of the two magnets, which were thus charged with magnetism. On its coming into that position, the current is cut off from these two magnets by the wire or rod of copper passing from the copper to the wood, and thereby breaking the connection with the battery. But when the wire or rod of copper leaves the copper on the one cylinder, it leaves the wood and passes to the copper on the other cylinder at the other end of the axle, and in so doing connects the other two magnets with the battery, and they pull the next iron bar in the same manner. At the other end of the carriage there are four other magnets and wooden cylinders with iron bars arranged in the same manner.

The battery which is used for propelling the machine is composed of iron and zinc plates immersed in dilute sulphuric acid, the iron plates being fluted so as to expose greater surface in the same space. The weight propelled was about six tons.

Electric Headlight Conference in Indiana.

At a conference at Indianapolis, May 27, participated in by representatives of practically all the railways of Indiana, called by the Indiana Railroad Commission, the substitution of the electric headlight for the oil headlight, now in general use on locomotives, was unanimously opposed. W. J. Wood, chairman of the commission, pointed out the provision of the recently enacted law empowering the commission to make an investigation. He referred to the unsuccessful effort made by labor organizations to have the legislature pass a law requiring the compulsory use of electric headlights of at least 2,000 c.p. H. F. Houghton (C., C. & St. L.), C. C. Coffey (Southern), D. F. Crawford (Pennsylvania), F. H. Curtis (L. & N.), J. R. Onderdoek (B. & O.) and J. E. Keegan (G. R. & I.) made the principal arguments.

Mr. Houghton read a paper giving reports of experiences and tests with the electric headlight. Mr. Crawford and Mr. Curtis likewise cited unfavorable experiences. The intensity of the rays destroys the power of the enginemen to distinguish the color of the various signal lamps. Sitting behind the strong rays for a time produces fatigue of the eyes. In the passing of opposing trains on parallel tracks the strong light produces temporary blindness in the opposite enginemen. Where a practical test was made with a number of enginemen who first successfully passed an examination for color blindness it was found that after facing the strong rays for a few hours and the signal lights were turned on they were unable to distinguish the color of the signals. Eight-tenths of their notations were erroneous. Mr. Crawford and others were emphatic in their denunciation of the electric light and declared they would not install them if furnished free of cost. They urged the commission not to make such a

serious mistake as to order the compulsory use of electric headlights.

Edwin Taylor, a locomotive engineer, who had had experience with electric headlights, declared there was little use for a headlight on a locomotive other than for a marker to enable trespassers on the tracks or travelers on the highways to observe the approach of a train. The ordinary 20 c.p. oil lamp was sufficient for all practical purposes.

Chairman Wood announced that the commission was not wholly satisfied with this *ex parte* evidence and would call another conference June 10. The Pennsylvania and the Big Four will then furnish locomotives equipped with electric headlights and engineers with them to make tests.

Restriction on R. R. B. Letters.

A circular has been issued by the Interstate Commerce Commission holding that the practice of one road carrying the mails of another without charge must be stopped. It has been the custom for roads to carry free of charge the mails of other roads with which they made direct connection. The commission states that this practice is illegal.

Notes on Railway Electrification.

John A. F. Aspinall, General Manager of the Lancashire & Yorkshire, points out that in our issue of May 7, page 989, the eighth line of the second column should read "center line of the motor," instead of "center line of the motor truck." This error occurred in the original document.

Edwin Hawley.

Edwin Hawley began by buying eggs; he is now buying railways. He is rapidly becoming a second Harriman. Already he has accomplished more than any living railway man with the exception of James J. Hill and Mr. Harriman. Outside of Wall street the name of Hawley is scarcely known, while even in financial circles his powerful ramifications are not adequately appreciated. He already controls seven railways and his close associates dominate two more; this combined system, 14,000 miles in length, has gross earnings of \$130,000,000. Of financial support Hawley has now an abundance, although he was not always so fortunate. Vanderlip, Speyer, Huntington, Paul Morton, J. J. Mitchell, Henry Walters, John W. Castles, Shonts, J. N. Wallace, L. C. Weir. Hawley is on the directorate of 25 corporations.

What manner of man is this new power in American transportation? * * * He was born in Chatham, N. Y. His railway work was begun on the Erie, as a clerk, when 17, and after being with the Ohio & Mississippi and the Rock Island he was made New York agent of the California Fast Freight Line and the other Southern Pacific interests. The first railway that he controlled was the Minneapolis & St. Louis about 1895. The next was the Iowa Central.

"It has been alleged that when you get control of a road you immediately contrive to pay the utmost dollar in dividends."

"That complaint is not justified. I have built up all my roads. They are in as good physical condition as other roads in the same territory. You must compare like with like. Remember that the roads are low grade traffic properties. I have spent in maintenance all that earnings warranted. I have not loaded them with floating debt—that point should not be overlooked by critics. As to increasing dividends, Chesapeake & Ohio is earnings between 6½ and 7 per cent. and has just been placed on a 4 per cent. basis. Chicago & Alton is earning 11 and is paying 4 per cent. That is not extravagant."

Answering further questions Mr. Hawley said:

"Mr. Hill and I are friends."

"The fact that you sold him Colorado & Southern and still remain a director strengthens the belief that you and he are becoming closely allied."

"We have always been friends. We have no reason to quarrel."

"You have a great admiration for Mr. Hill?"

"Hill is a great man—the greatest railway builder in this country to-day."

"Greater than Harriman?"

"Yes, a greater builder. Harriman took roads already built and developed them. Hill is more like Huntington."

"Who is the greatest railway man American has ever produced?"

"Huntington, because he had to blaze the way. He had to build the foundation; he was a pioneer." * * *

"Mr. Hawley, your system of roads lacks a vital joint—from St. Louis or Chicago to Cincinnati or Louisville. I thought you would have bought the C., H. & D. from its reorganizers to bridge the gap."

"I could have had it, but I didn't want it. It is too heavily laden with debt."

"You have arranged to buy the Chicago, Cincinnati & Louisville, it is reported."

"So they say. I am not saying it."

"Well, you must find some way to join the two parts of your system."

"I can do that. That will not be difficult. The distance from Cincinnati to the Toledo, St. Louis & Western is short. I can easily get a road, or make one."—*Journal of Commerce*, New York.

American Society of Civil Engineers.

At the meeting held on June 2 two papers were presented for discussion: Tests of Built-Up Steel and Wrought Iron Compression Pieces, by Arthur N. Talbot, M. Am. Soc. C. E., and Herbert F. Moore, Esq., and Caisson Disease and Its Prevention, by Henry Japp, M. Am. Soc. C. E. These papers were printed in the April number of "Proceedings."

Society of Railway Club Secretaries.

The annual meeting will be held at the Hotel Brighton, Atlantic City, N. J., on Saturday, June 19, at 10 a.m. The annual dinner will be held in the evening, at a time and place to be announced at Atlantic City.

National Machine Tool Builders' Association.

The semi-annual convention of the National Machine Tool Builders' Association was held at the Plankinton House, Milwaukee, Wis., May 25 and 26, 55 members being in attendance. The President is Fred L. Eberhardt, of Newark, N. J., and the Secretary is P. E. Montanes, of Springfield, Ohio. The seventh annual meeting of this association was held in New York City October, 1908, and the only meeting which has been previously held in the West was the semi-annual meeting in 1904, in Cincinnati, Ohio. At the meeting on May 25 the principal business related to the reports of officers, standing committees and special committees, and it concluded with an address on "Competition" by Murray Shippey. In the afternoon the several committees on tools (on lathes, shapers, drills, milling machines, etc.), held separate meetings, and on May 26 these committees made their reports. The convention closed with an address on "Machine Tools for Railroad Shops," by William Forsyth, Associate Editor of the *Railroad Age Gazette*. After adjournment a large number of the members visited the shops of Kearney & Trecker, manufacturers of milling machines, also the large shops of the Allis-Chalmers Company.

American Society for Testing Materials.

The twelfth annual meeting of the American Society for Testing Materials will be held at Atlantic City, N. J., June 29 to July 3. The headquarters will be at the Hotel Traymore. The social features include an informal dinner on the evening of July 1 and an engineering smoker on the evening of July 2.

The subject of the annual address by the President, Dr. C. B. Dudley, will be Engineering Responsibility. Among the

papers of more particular interest to railways are the following: Further Investigations of Broken Steel Rails, by Henry Fay and R. W. G. Wint; An Investigation of a Defective Open-Hearth Steel Rail, by Robert Job; report of Committee A on Standard Specifications for Iron and Steel, W. R. Webster, Chairman; report of Committee M on Standard Specifications for Staybolt Iron, by H. V. Wille; three papers by P. H. Dudley; Detailed Fractures of Cold-Rolled Rails at Low Temperatures, Elongation and Ductility Tests of Rail Sections Under the Manufacturers' Standard Drop-Testing Machine, and Dark Carbon Streaks in Segregated Metal of Split Heads of Rails; report of Committee U on The Corrosion of Iron and Steel, A. S. Cushman, Chairman; Notes on Corrosion Tests of Iron and Steel, by R. B. Carnahan, Jr.; report of Committee E on Preservative Coatings for Iron and Steel, S. S. Voorhees, Chairman, and An Interesting Driving-Axle Failure, by M. H. Wickhorst.

The program is unusually large and includes more than 60 papers and reports.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
 AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.
 AMERICAN ASSOC. OF LOCAL FREIGHT AGENTS' ASS'N.—G. W. Dennison, Penna. Co., Toledo, O.; June 22-25; Albany, N. Y.
 AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
 AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York.
 AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, R. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
 AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago.
 AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—R. E. Wilson, Ry. Exchange, Chicago.
 AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
 AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 29-July 3; Atlantic City.
 AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.
 AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month; annual, Dec. 7-10; New York.
 AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York; Oct. 18-22; Denver, Colo.
 ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; June, 1910; Colorado Sp'gs.
 ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May 26-28, 1909; Detroit, Mich.
 ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.
 ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.
 CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
 CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.
 CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
 FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
 INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
 INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.
 INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.
 IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
 MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
 NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
 NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
 NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
 RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
 RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; June 8, New York.
 RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C., Collinwood, Ohio.
 ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
 ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
 SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Norquist, Chicago; Sept. 7-8; Fort William Henry, Lake George, N. Y.
 SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.
 SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.
 TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
 WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, 199 Chestnut St.; Winnipeg; 2d Mon., ex. June, July and Aug.; Winnipeg.
 WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
 WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago, 1st Wednesday, except July and August; Chicago.

Traffic News.

Beginning June 1 the Louisville & Nashville and its controlled lines in Alabama adopted in that state the reduced passenger fares which were ordered by the legislature of the state. The enforcement of this law has been contested in the courts for many months.

The Rock Island has been trying for some weeks the experiment of running trains "all night" from Chicago to a number of suburbs on its lines near that city. While the service has not yet proved profitable, it has built up a more satisfactory business than was expected and will be continued indefinitely.

Reports from Bakersfield, Cal., indicate that the independent oil producers are about ready to establish a complete system of pipe lines for conveying oil from the Kern county and Coalinga fields to the Pacific coast, and that terminal facilities at the seaboard will be provided, together with tank steamers, so that oil can be delivered to all points on the coast.

The trunk lines leading from New York, Philadelphia and Baltimore to the West have filed at Washington tariffs on import freight westbound, to take effect July 1, by which these roads aim to restore the differential which was obliterated by the reductions lately made by the Boston & Maine. On first-class the reductions are 3 cents per 100 lbs. and on the lower classes 1 cent.

At a meeting of the executive committee of the Western Passenger Association held in Chicago on May 27 it was recommended that all western roads grant a rate of one and one-half fare for the round trip for state fairs and conventions which give promise of sufficient business to warrant a low rate, and also that a rate of one and one-half fare for the round trip be made for the merchants' meetings which the Chicago Association of Commerce will hold early in the fall.

The Commercial Club Traffic Bureau of Salt Lake City has adopted a resolution protesting to the Interstate Commerce Commission against the rule of the transcontinental lines giving the initial carrier the "absolute and unqualified right" to determine the routing of shipments beyond its own line. The traffic bureau says that the application of this rule is an unreasonable burden on shippers and a direct infringement on their rights, and paves the way for the carriers to enter into an effective but unlawful arrangement for the secret division of traffic.

The Executive Committee of the Southwestern Shippers Association has adopted a resolution to the effect that there ought to be on the Interstate Commerce Commission a representative of the shipping interests of the southwestern portion of the United States—"in other words someone who knows intimately and at first hand the traffic conditions that are as yet new on account of the chaotic and constantly changing condition of affairs caused by the fast development of the country." The secretary of the Association was instructed to bring this matter to the attention of the President of the United States.

At Charleston, W. Va., May 26, the Chesapeake & Ohio applied for an injunction to prohibit the officers of the state from enforcing the 2-cent fare law on the Chesapeake & Ohio. A statement was presented showing the receipts, cost and profit of the intrastate passenger business on that line in West Virginia during 18 months under the 2-cent law, in which it was declared that the net earnings were far below the sum necessary to pay the interest on that part of the company's bonded indebtedness which should be charged to this traffic. It is declared that the law was unsuccessful in stimulating traffic, as had been anticipated, and the company really lost about \$600,000 in the 18 months. The present average receipts per passenger in West Virginia amount to only 1.78 cents a mile.

The Dominion government is making an investigation as to the cost of the transportation of goods from Montreal to the Canadian ports on the Pacific coast by water *via* Mexico over

the Tehuantepec Railway and thence by water again to destination, as compared with the freight rates charged by the Canadian Pacific for the all-rail haul. David Martin, Customs Inspector of Toronto, has been sent to Mexico to investigate the customs relations regarding the bonding of goods in transit through Mexico. It is claimed that freight is carried by this route 20 per cent. cheaper than overland by the Canadian Pacific, and that the high railway freight renders it impossible for eastern Canadian manufacturers shipping goods by the C. P. R. to compete successfully in British Columbia with Europeans sending goods round Cape Horn.

In connection with the dissensions among the trunk lines concerning westbound freight rates on imported goods figures have been published showing the total quantities of freight received by ocean vessels and shipped westward from New York during the year 1908. New York leads with 150,000 tons, and Baltimore follows with 145,000, Boston had 85,000, Philadelphia 85,000 (including 14,000 tons of nitrate of soda from South America, a trade not reckoned with in statistics of other cities), Newport News 18,000 and the combined ports of Portland, Montreal and West St. John 30,000 tons. Baltimore's gain, as compared with previous years, cannot be given in figures, but it is said that it has been increasing the volume of this traffic much more rapidly than any other large port. In explanation of the fact that they have not met the last import rate cut of the Boston & Maine, effective June 2, some of the trunk lines call attention to the fact that the Boston lines carry only a small proportion of the import business; and of the 85,000 tons of import freight handled at Boston in 1908, 70,000 took low commodity rates.

Readjustment of Transcontinental Freight Rates.

The plans of the transcontinental railways for the readjustment of freight rates between the central west and the Pacific coast are being received with almost universal opposition by the communities most directly affected. The plan for the readjustment of rates to Spokane is a fair index to the general plan that would be followed throughout the West if the scheme of rates to Spokane which the railways have proposed should finally go through. The following outlines the scheme of rates to Spokane, which the railways submitted to the Interstate Commerce Commission for its consideration:

"First—Adopt the class rates from St. Paul and Chicago as fixed by the Interstate Commerce Commission. Apply same class rates from Omaha as from St. Paul, and from St. Louis the same as from Chicago, except where combination of locals on Missouri river makes less; from Denver 90 per cent. of the Missouri river-Spokane rates, which is proportionate to the distance.

"Second—Reduce the class rates from the Coast to Spokane proportionately the same as the Commission rates from St. Paul to Spokane—that is, 16 2-3 per cent.

"Third—Establish commodity rates from Chicago to Spokane that will effectively meet competition of the water route from the Atlantic seaboard to Seattle, thence by rail to Spokane. The rates of water lines to Seattle vary. The Panama line publishes 60 per cent. of the all-rail rates, and the American-Hawaiian line applies generally about the same, but for the purpose of constructing the Spokane tariffs 75 per cent. of the present rail rates from Atlantic seaboard territory to Seattle has been adopted as representing a fair equalization of the ocean rate, taking into consideration the items of despatch, damage from rehandling, insurance, interior origin of some of the freight, etc. The rate to Spokane would be obtained by adding the new local tariff from Seattle to Spokane. Having thus determined what rates are necessary to Spokane to fully meet water competition, these rates are fixed from Chicago on such commodities as can be produced in this territory as advantageously as on the Atlantic seaboard. Lower rates are made: (a) where articles are principally or exclusively produced in Eastern territory, the local rate to Chicago is deducted so that the combination on Chicago from points of origin will be on water competitive basis; (b) where commodity is produced both in the East and in Chicago territory, but cost of production in the West is higher, a deduction is made in consideration of these commercial conditions

and the advantage to the western lines by originating the traffic nearer their terminals. The Commission class rates are observed as maximum.

"Fourth—Exceptions to such commodity basis made where article is not subject to water competition or where local competition and other commercial conditions control, such as beer, oil, plaster, salt, cement, butter, furniture, packing-house products, etc.

"Fifth—Rates from St. Paul to Spokane lower than from Chicago in recognition of the additional cost of production there and advantages to the carriers in originating the traffic at their own eastern terminals."

The Commission will give a hearing at Washington on June 9, at which all interested parties are invited to appear.

As stated in our last issue, the shippers of Spokane are protesting against this scheme of readjustment. They claim that on the new basis some rates would be higher than on the old basis. Take, for example, the rates on cotton duck and denims in carloads. The present rate from New England to Spokane is \$1.85, and the rate is the same from Chicago. The Interstate Commerce Commission ordered a rate of \$1.75 from Chicago to Spokane. The railways suggested a rate of \$1.32; and as all such goods are made in New England, under section 3 of the plan favored by the railways, the local rate of 55 cents from New England to Chicago would be added to the Chicago-Spokane rate of \$1.32, making a total of \$1.87, which is 2 cents more than the present rate.

The numerous protests received from shippers at Spokane caused J. G. Woodworth, Traffic Manager of the Northern Pacific, and W. P. Kenney, Assistant Traffic Manager of the Great Northern, to go to Spokane last week to confer with the shippers. It is reported that no satisfactory understanding was reached.

In the meantime the shippers at Pacific coast points are protesting violently against the proposed readjustment. The second section of the plan provides for the reduction of class rates from the coast to Spokane 16 2-3 per cent., which is the same percentage of reduction that is to be made from St. Paul to Spokane. William R. Wheeler, Manager of the Traffic Bureau of the Merchants' Exchange of San Francisco, says that this is unfair and inequitable to shippers at coast points, and that if the same principle were applied to rates throughout the territory affected, Pacific coast shippers would be placed at a great disadvantage in competing for business as compared with shippers on the Atlantic seaboard and at Chicago, St. Louis, the Twin Cities and Missouri river points. For example, the existing first-class rate from St. Paul to Spokane is \$3. A reduction of 16 2-3 per cent. in this makes a specific reduction of 50 per cent. The existing first-class rate from Portland, Seattle and Tacoma to Spokane is \$1.35, and 16 2-3 per cent. of this is 22½ cents. Therefore, if only the same percentage of reduction is made from the Pacific coast as is made from St. Paul, the readjustment will put the shippers at the Pacific coast cities at an increased disadvantage of 27½ cents in competing for business at inland points against the shipper at St. Paul. Mr. Wheeler says, however, that the third proposition is by far the most destructive to Pacific coast distributing interests of any under consideration. He has issued a statement which is in part as follows:

"Up to the present time tariffs from the East to interior points have been constructed by adding to the terminal commodity rate the local or distributive rate applying from the nearest terminal to the interior point, thus enabling the distributor at the terminal point to compete on even terms with the eastern, or, more properly speaking, middle west jobber. Owing to the high local rates prevailing upon the Pacific Coast even under this arrangement it was impossible except in rare instances for the Pacific Coast distributor to get beyond the states of Idaho and Nevada, within the boundaries of which states his limit of distribution was fixed at the points where the combination rate above described met the so-called 'intermediate rates' from the East, the latter rates to points easterly of such meeting place being, of course, lower than the combination of terminals and locals back. Not satisfied with thus limiting his zone of distribution, or, rather, zone where the Pacific Coast distributor has a fighting chance, the railways propose to put him out of business beyond the limits of his own dooryard by reducing the terminal

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues				Operating expenses				Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decrease) last year.
		Freight.	Passenger.	Inc. misc.	Total.	Way and structures.	Maintenance of equipment.	Traffic.	Portation.					
Atchafalpa, Topeka & Santa Fe.....	7,458	\$4,472,469	\$1,543,085	\$6,598,246	\$12,613,800	\$821,278	\$1,760,195	\$1,760,195	\$1,760,195	\$2,843,383	\$2,843,383	\$234,000	\$2,609,383	\$123,530
Buffalo, Rochester & Pittsburgh.....	1,568	470,544	68,070	538,614	1,147,228	34,182	124,212	124,212	124,212	214,902	214,902	872*	204,550	119,604
Chesapeake & Ohio.....	1,896	1,730,160	253,811	2,000,000	4,783,971	200,118	326,746	44,196	615,254	44,196	615,254	204	792,108	284,661
Chicago & Eastern Illinois.....	1,965	3,257,409	1,211,749	4,469,158	8,938,306	626,555	1,082,447	21,255	288,106	288,106	288,106	1,081*	255,301	208,049
Chicago & North Western.....	7,634	3,257,409	1,211,749	4,469,158	8,938,306	626,555	1,082,447	21,255	288,106	288,106	288,106	1,081*	255,301	208,049
Chicago, Burlington & Quincy.....	9,023	4,988,801	1,211,749	6,200,550	12,401,099	1,541,759	1,142,280	125,700	1,960,650	1,960,650	1,960,650	1,960,650	1,835,442	342,134
Chicago, St. Paul, Minn. & Omaha.....	1,739	698,771	292,536	1,000,307	2,000,603	117,171	1,147,238	21,759	1,985,811	1,985,811	1,985,811	1,985,811	1,835,442	342,134
Colorado & Southern.....	1,250	476,463	292,536	1,000,307	2,000,603	117,171	1,147,238	21,759	1,985,811	1,985,811	1,985,811	1,985,811	1,835,442	342,134
Delaware, Lackawanna & Western.....	883	1,250,871	527,551	1,778,422	3,555,973	357,833	382,606	56,769	707,843	707,843	707,843	707,843	655,256	52,587
El Paso & Southwestern.....	1,901	2,551,216	626,156	3,177,372	6,354,744	277,637	713,127	83,131	1,104,765	1,104,765	1,104,765	1,104,765	1,118,873	13,108
Grand Rapids & Indiana.....	591	2,735,522	886,726	3,622,248	7,244,494	57,227	470,413	63,889	1,100,464	1,100,464	1,100,464	1,100,464	1,118,873	13,108
Gulf, Colorado & Santa Fe.....	1,518	636,733	206,492	843,225	1,686,445	171,049	129,978	19,652	330,589	330,589	330,589	330,589	330,589	330,589
Illinois Central.....	4,518	2,751,202	814,795	3,565,997	7,131,994	504,089	865,554	24,515	1,300,736	1,300,736	1,300,736	1,300,736	1,300,736	1,300,736
Kansas City Southern.....	827	583,385	392,121	975,506	1,970,911	87,129	808,294	8,409	258,129	258,129	258,129	258,129	258,129	258,129
Lehigh Valley.....	1,446	2,468,588	302,255	2,770,843	5,541,691	275,198	427,201	72,304	808,294	808,294	808,294	808,294	808,294	808,294
Maine Central.....	931	409,723	191,693	601,416	1,203,534	99,755	131,903	29,167	279,158	279,158	279,158	279,158	279,158	279,158
Mobile & Ohio.....	1,098	2,383,934	1,900,736	4,284,670	8,584,606	591,943	518,114	23,255	1,855,028	1,855,028	1,855,028	1,855,028	1,855,028	1,855,028
New York, New Haven & Hartford.....	1,998	568,844	97,211	666,055	1,332,066	75,306	109,599	10,190	257,833	257,833	257,833	257,833	257,833	257,833
Norfolk & Western.....	461	837,263	156,049	993,312	1,986,624	133,966	144,603	13,846	439,471	439,471	439,471	439,471	439,471	439,471
Norfolk & Western.....	5,695	3,541,262	1,403,016	4,944,278	9,888,554	714,542	647,074	83,681	1,569,333	1,569,333	1,569,333	1,569,333	1,569,333	1,569,333
Pennsylvania Railroad.....	1,930	2,069,458	269,350	2,338,808	4,677,658	282,166	417,158	42,742	674,866	674,866	674,866	674,866	674,866	674,866
Pere Marquette.....	1,416	2,455,360	536,730	2,992,090	5,984,180	523,443	547,475	65,236	1,155,906	1,155,906	1,155,906	1,155,906	1,155,906	1,155,906
Philadelphia, Baltimore & Wash'n.....	2,341	2,727,334	496,231	3,223,565	6,450,796	353,662	506,000	34,505	981,366	981,366	981,366	981,366	981,366	981,366
Philadelphia, Baltimore & Wash'n.....	1,006	703,746	573,057	1,276,803	2,553,660	201,000	224,636	24,950	595,014	595,014	595,014	595,014	595,014	595,014
Pitts., Chic. & St. Louis.....	1,472	1,845,548	531,776	2,377,324	4,754,648	476,778	481,639	64,892	969,591	969,591	969,591	969,591	969,591	969,591
San Antonio & Aransas Pass.....	727	2,211,017	11,086	2,222,103	4,433,210	483,811	693,811	105,763	1,512,782	1,512,782	1,512,782	1,512,782	1,512,782	1,512,782
Southern Railway in Mississippi.....	280	37,099	21,868	58,967	118,965	24,057	63,737	2,473	29,455	29,455	29,455	29,455	29,455	29,455
Toledo & Ohio Central.....	829	459,058	195,623	654,681	1,309,361	131,101	124,782	20,438	274,488	274,488	274,488	274,488	274,488	274,488
Vandalia.....	1,371	534,903	144,314	679,217	1,363,531	200,958	123,838	15,871	288,817	288,817	288,817	288,817	288,817	288,817
Yazoo & Mississippi Valley.....	1,371	6,101,801	1,478,805	7,580,606	15,159,206	1,690,405	1,427,384	158,197	3,207,404	3,207,404	3,207,404	3,207,404	3,207,404	3,207,404
Atchafalpa, Topeka & Santa Fe.....	7,458	\$4,472,469	\$1,543,085	\$6,598,246	\$12,613,800	\$821,278	\$1,760,195	\$1,760,195	\$1,760,195	\$2,843,383	\$2,843,383	\$234,000	\$2,609,383	\$123,530
Buffalo, Rochester & Pittsburgh.....	1,568	470,544	68,070	538,614	1,147,228	34,182	124,212	124,212	124,212	214,902	214,902	872*	204,550	119,604
Chesapeake & Ohio.....	1,896	1,730,160	253,811	2,000,000	4,783,971	200,118	326,746	44,196	615,254	44,196	615,254	204	792,108	284,661
Chicago & Eastern Illinois.....	1,965	3,257,409	1,211,749	4,469,158	8,938,306	626,555	1,082,447	21,255	288,106	288,106	288,106	1,081*	255,301	208,049
Chicago & North Western.....	7,634	3,257,409	1,211,749	4,469,158	8,938,306	626,555	1,082,447	21,255	288,106	288,106	288,106	1,081*	255,301	208,049
Chicago, Burlington & Quincy.....	9,023	4,988,801	1,211,749	6,200,550	12,401,099	1,541,759	1,142,280	125,700	1,960,650	1,960,650	1,960,650	1,960,650	1,835,442	342,134
Chicago, St. Paul, Minn. & Omaha.....	1,739	698,771	292,536	1,000,307	2,000,603	117,171	1,147,238	21,759	1,985,811	1,985,811	1,985,811	1,985,811	1,835,442	342,134
Colorado & Southern.....	1,250	476,463	292,536	1,000,307	2,000,603	117,171	1,147,238	21,759	1,985,811	1,985,811	1,985,811	1,985,811	1,835,442	342,134
Delaware, Lackawanna & Western.....	883	1,250,871	527,551	1,778,422	3,555,973	357,833	382,606	56,769	707,843	707,843	707,843	707,843	655,256	52,587
El Paso & Southwestern.....	1,901	2,551,216	626,156	3,177,372	6,354,744	277,637	713,127	83,131	1,104,765	1,104,765	1,104,765	1,104,765	1,118,873	13,108
Grand Rapids & Indiana.....	591	2,735,522	886,726	3,622,248	7,244,494	57,227	470,413	63,889	1,100,464	1,100,464	1,100,464	1,100,464	1,118,873	13,108
Gulf, Colorado & Santa Fe.....	1,518	636,733	206,492	843,225	1,686,445	171,049	129,978	19,652	330,589	330,589	330,589	330,589	330,589	330,589
Illinois Central.....	4,518	2,751,202	814,795	3,565,997	7,131,994	504,089	865,554	24,515	1,300,736	1,300,736	1,300,736	1,300,736	1,300,736	1,300,736
Kansas City Southern.....	827	583,385	392,121	975,506	1,970,911	87,129	808,294	8,409	258,129	258,129	258,129	258,129	258,129	258,129
Lehigh Valley.....	1,446	2,468,588	302,255	2,770,843	5,541,691	275,198	427,201	72,304	808,294	808,294	808,294	808,294	808,294	808,294
Maine Central.....	931	409,723	191,693	601,416	1,203,534	99,755	131,903	29,167	279,158	279,158	279,158	279,158	279,158	279,158
Mobile & Ohio.....	1,098	2,383,934	1,900,736	4,284,670	8,584,606	591,943	518,114	23,255	1,855,028	1,855,028	1,855,028	1,855,028	1,855,028	1,855,028
New York, New Haven & Hartford.....	1,998	568,844	97,211	666,055	1,332,066	75,306	109,599	10,190	257,833	257,833	257,833	257,833	257,833	257,833
Norfolk & Western.....	461	837,263	156,049	993,312	1,986,624	133,966	144,603	13,846	439,471	439,471	439,471	439,471	439,471	439,471
Norfolk & Western.....	5,695	3,541,262	1,403,016	4,944,278	9,888,554	714,542	647,074	83,681	1,569,333	1,569,333	1,569,333	1,569,333	1,569,333	1,569,333
Pennsylvania Railroad.....	1,930	2,069,458	269,350	2,338,808	4,677,658	282,166	417,158	42,742	674,866	674,866	674,866	674,866	674,866	674,866
Pere Marquette.....	1,416	2,455,360	536,730	2,992,090	5,984,180	523,443	547,475	65,236	1,155,906	1,155,906	1,155,906	1,155,906	1,155,906	1,155,906
Philadelphia, Baltimore & Wash'n.....	2,341	2,727,334	496,231	3,223,565	6,450,796	353,662	506,000	34,505	981,366	981,366	981,366	981,366	981,366	981,366
Philadelphia, Baltimore & Wash'n.....	1,006	703,746	573,057	1,276,803	2,553,660	201,000	224,636	24,950	595,014	595,014	595,014	595,014	595,014	595,014
Pitts., Chic. & St. Louis.....	1,472	1,845,548	531,776	2,377,324	4,754,648	476,778	481,639	64,892	969,591	969,591	969,591	969,591	969,591	969,591
San Antonio & Aransas Pass.....	727	2,211,017	11,086	2,222,103	4,433,210	483,811	693,811	105,763	1,512,782	1,512,782	1,512,782	1,512,782	1,512,782	1,512,782
Southern Railway in Mississippi.....	280	37,099	21,868	58,967	118,965	24,057	63,737	2,473	29,455	29,455	29,455	29,455	29,455	29,455
Toledo & Ohio Central.....	829	459,058	195,623	654,681	1,309,361	131,101	124,782	20,438	274,488	274,488	274,488	274,488	274,488	274,488
Vandalia.....	1,371	534,903	144,314	679,217	1,363,531	200,958	123,838	15,871	288,817	288,817	288,817	288,817	288,817	288,817
Yazoo & Mississippi Valley.....	1,371	6,101,801	1,478,805	7,580,606	15,159,206	1,690,405	1,427,384	158,197	3,207,404	3,207,404	3,207,404	3,207,404	3,207,404	3,207,404

*Deficit. †Loss. ‡Decrease.

commodity rates 25 per cent, for the sole purpose of constructing the Spokane tariff, and, necessarily, tariffs to other interior points. To make this proposition plain I will use simple figures which, of course, have no relation to any existing rate, but at the same time illustrate clearly the result of a tariff so constructed.

"Assuming that the rate on a given commodity from New York to Seattle is \$1 per 100 pounds and the local rate from Seattle to Spokane is 75 cents, thus, under the present method of tariff construction, making the rate from New York to Spokane \$1.75, this gives the Seattle distributor a fighting chance in Spokane.

"Under the proposed plan, while the rate of \$1 will remain in force between New York and Seattle, so far as shipments to the latter city are concerned, this rate will be reduced to 75 cents when shipment is destined to Spokane. Adding the local rate of 75 cents thereto we have the through rate New York to Spokane of \$1.50, thus putting the Seattle jobber at a disadvantage of 25 cents per 100 pounds in competition with the New York jobber and effectually putting the former out of this business.

"Having thus given New York an advantage over Seattle with regard to Spokane business, the railways propose to apply the New York rate on business originating in Chicago where cost of production is the same, thus with respect to this business, picking Chicago up bodily and placing her upon the Atlantic seaboard inasmuch as she is given the benefit of New York's advantageous geographical location.

"This, however, is a situation which has for some time prevailed with regard to practically all business originating between the Atlantic seaboard and the Missouri river, and is, perhaps the best possible compromise between graded rates (i. e., lower rates from Chicago than are established from New York by reason of sea competition at that port) and trunk line arbitraries (i. e., higher rates from Chicago than from New York by the addition of the rate in force from Chicago to New York to the sea competitive rate prevailing at that seaport), and has, up to this time, been acceptable to the Pacific Coast distributors as a compromise only. As a matter of fact, the principle, once adopted as such, would be destructive to the prosperity of every Pacific Coast seaport and contiguous territory, inasmuch as it destroys the advantages inherent to such seaboard location when applied to east-bound shipments covering all Pacific Coast products and manufactures.

"Not content with applying this equalization of rates to all business originating in Chicago, the railways propose to arrange their tariff so that articles produced exclusively on the Atlantic Seaboard shall be handled by the Chicago jobber rather than by the Seattle jobber. Having established the rates from the Atlantic seaboard to Spokane in the manner described in their third proposition, they propose to still further assist the Chicago jobber by refunding to him the cost of bringing into his warehouse such articles of exclusively Atlantic seaboard origin as are later reshipped to Spokane. This is accomplished by deducting from the rate in force between New York and Spokane the rates applying to such articles between New York and Chicago, thus enabling the rate from Chicago to Spokane. For example, if the rate on such an article from New York to Spokane is \$1.50 and the rate on the same article from New York to Chicago is 25 cents, this establishes a rate of \$1.25 from Chicago to Spokane as against \$1.75 if purchased through a Seattle jobber.

"Again, upon a plea from the Chicago manufacturer that his cost of production is higher than that of New York, the railways propose to equalize both his alleged manufacturing and commercial disadvantages by making his rate from Chicago to Spokane as much lower than that from New York as is necessary 'in order to concentrate the business in Chicago.'

He says that if the proposed plan should be applied to the rates to Spokane, it would no doubt be applied in the readjustment of rates to Reno, Las Vegas and Albuquerque, N. M., Tucson, Ariz., and Salt Lake City, and that the eastern and central western jobber and manufacturer would be given the monopoly of the business of most of the West to the detriment of not only the Pacific Coast cities, but also of Spokane and other inland points.

Resolutions were adopted at a meeting of the various com-

mercial associations of San Francisco on May 24, opposing the plan of readjustment suggested by the railways.

Committee on Uniform Classification.

The Committee on Uniform Classification, Chicago, desires to secure the following information about all commodities that enter into railway traffic: (1) Nature of article, (2) constituent elements, (3) uses, (4) value per unit of sale, (5) value per cubic foot, or gallon, etc., (6) weight per cubic foot, (7) loading weight per car, (8) styles of packing.

The readers of the *Railroad Age Gazette* are familiar with the work on which this committee is engaged. It is important both to railways and to shippers. The Freight Traffic Committee of the Chicago Association of Commerce, recognizing its importance to shippers, has issued a statement asking its members to co-operate with the committee in securing such information as is desired. The committee's work would be much facilitated if all commercial organizations would similarly co-operate with it. It is not engaged in any general revision of classes or rates, but is trying at present to adopt uniform definitions of all commodities, which must be the foundation of any uniform classification.

INTERSTATE COMMERCE COMMISSION.

A rate once lawfully published continues to be the lawful rate until it has been lawfully canceled. A subsequent tariff naming other rates without canceling the previous rates cannot carry the new rates into lawful effect; and the silence of a subsequent tariff cannot be accepted as a lawful cancellation of rates previously established. (16 I. C. C. Rep. 315.)

STATE COMMISSIONS.

W. E. Fitzgerald, chief clerk to the auditor of the Houston & Texas Central, has been selected auditor of the Railroad Commission of Texas, succeeding J. H. Bond, deceased.

The Indiana Railroad Commission has ordered a switching rate of \$3 a car at the intersection of several roads at Bloomington. The rate heretofore charged at this point varied from \$5 to \$21 a car. The new rate ordered becomes effective June 1, and affects the Chicago, Indianapolis & Louisville and the Indianapolis Southern.

COURT NEWS.

See an item in regard to the New York, New Haven & Hartford under Railroad Financial News.

The Supreme Court of Missouri refused on May 29 to cite the Missouri, Kansas & Texas for contempt because it violated an injunction of Circuit Judge Williams, of St. Louis, restraining the road from raising its passenger rate from 3 cents a mile.

The Oregon Railroad Commission has brought suit in the name of the state against the Corvallis & Eastern (Southern Pacific) for \$10,000 penalty because the company refused to obey the order of the commission for the erection of a station building at Lyons, Ore.

In the case of the Southern Railway against the Interstate Commerce Commission, wherein the road denied the lawfulness of the action of the commission in fixing a charge for the reconsignment of hay shipped from the West through St. Louis to southern states, the Supreme Court of the United States has decided in favor of the railway.

The St. Louis & Southwestern, the Chicago & Alton, the Frisco, the Rock Island, the Kansas City Southern, the St. Louis, Kansas City & Colorado and the Chicago, Milwaukee & St. Paul, have filed demurrers in the Supreme Court to the information by the Attorney-General charging them with violating the state and trust law by combining to raise their passenger rates.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

C. B. Udell has been elected Treasurer of the Houston & Texas Central, succeeding W. H. Field, resigned.

L. E. Katzenbach has been elected the Secretary of the Colorado & Midland, succeeding James S. Mackie.

William M. Barrett, Vice-President of the Adams Express Co., has been elected the President, succeeding Levi C. Weir, resigned.

R. S. Ege, formerly chief clerk to the Auditor of the Union Pacific, has been appointed Assistant Auditor, with office at Omaha, Neb.

The office of E. J. Chamberlin, Vice-President and General Manager of the Grand Trunk Pacific, has been moved from Montreal, Que., to Winnipeg, Man.

John F. Stevens, Vice-President in charge of Traffic of the New York, New Haven & Hartford, has resigned to accept service elsewhere. His former office has been abolished and the General Manager is to report to the President.

Harry E. Byram, whose appointment as an Assistant to the Second Vice-President of the Chicago, Burlington & Quincy, with office at Chicago, has been announced already in these columns, was born on November 28, 1865, at Galesburg, Ill. He began railway work in 1881 as call boy on the Burlington at Galesburg, since which time he has been consecutively to 1889 stenographer in the General Superintendent's office and chief clerk to the Superintendent of Terminals at Chicago; 1889 to 1894 out of railway service; 1894 to March, 1898, clerk in General Manager's office and chief clerk in Vice-President's office of the Great Northern at St. Paul, Minn.; March, 1898, to October, 1899, Assistant General Superintendent of the Montana Central at Great Falls, Mont.; October, 1899, to October, 1902, Superintendent of the Cascade division, Great Northern, at Everett, Wash.; October, 1902, to February, 1904, Assistant to First and Fourth Vice-Presidents, Chicago, Rock Island & Pacific at Chicago; February 1, 1904, to July, 1904, General Superintendent Southwestern district at Topeka, Kan.; September, 1904, until promoted General Superintendent Nebraska district, Chicago, Burlington & Quincy.

Operating Officers.

George B. Beale has been appointed the Superintendent of the Buffalo division of the Pennsylvania, succeeding Robert Bell, assigned to other duties.

S. J. Mulvaney, Trainmaster of the Atlanta division of the Southern Railway, has been appointed Superintendent of the Virginia & Southwestern, with office at Bristol, Tenn.

E. T. Lamb, Superintendent of the Southern Railway at Norfolk, Va., has been appointed the General Manager for the receivers of the Norfolk & Southern, effective June 15.

I. E. Ramsdell, Assistant Trainmaster of the Pittsburgh & Lake Erie, has been appointed the General Trainmaster, with office at Youngstown, Pa., succeeding Elias Reese, deceased.

J. E. Tussey, Superintendent of Maintenance of the Georgia, Florida & Alabama, has been appointed the General Manager, with office at Bainbridge, Ga., succeeding J. E. O'Dell, resigned.

H. A. Shepard has been appointed the Assistant Superintendent of Telegraph of the New York, New Haven & Hartford, with office at New Haven, Conn., succeeding W. H. D. Ford, resigned.

H. B. Earling, General Superintendent of the Chicago, Milwaukee & Puget Sound lines east of Butte, Mont., has had his jurisdiction extended over the lines west of Butte, and his office will be transferred from Miles City, Mont., to Butte.

The Buffalo division of the Pennsylvania will hereafter consist of the Union Terminal of Buffalo, N. Y.; those portions

of the line of the Western New York & Pennsylvania from Buffalo to Emporium, Pa.; from Winchester to South Buffalo Ore Docks; from Buffalo to Oil City, Pa.; from Tryonville, Pa., to Lakeville, and from Titusville, Pa., to Pioneer, the Genesee Valley Canal Railroad; the Genesee Valley Terminal; the Rochester, New York & Pennsylvania, and the McKean & Buffalo. The Allegheny division will consist of the lines of the Allegheny Valley (with the exception of that portion included in the Conemaugh division); the Brookville Railway; those portions of the line of the Western New York & Pennsylvania from Oil City to Irvineton, and from Warren, Pa., to Olean, N. Y.; the Kinzua Railway; the Kinzua Valley Railroad; the Bradford Railway; the Olean, Bradford & Warren Railway, and the Olean, Bradford & Warren Railroad. The Chautauqua division will be abolished as a separate division. The office of the Superintendent of the Allegheny division will be located at Oil City, Pa.

Traffic Officers.

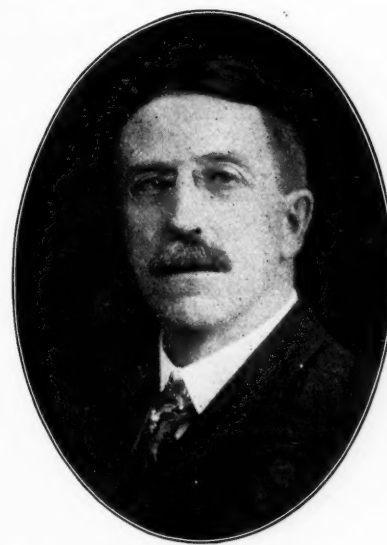
F. B. Peters has been appointed a Traveling Freight Agent of the Detroit, Toledo & Ironton, with office at Ironton, Ohio.

D. L. Melville has been appointed a Traveling Freight and Passenger Agent of the Baltimore & Ohio, with office at Seattle, Wash.

A. G. Payne has been appointed a General Agent of the Louisville & Nashville, with office at Jacksonville, Fla., succeeding H. G. Stewart, resigned.

H. T. Drane has been appointed a Soliciting Agent of the Louisville & Nashville, with office at Selma, Ala., vice A. G. Payne, assigned to other duties.

William B. Barr, whose resignation as General Freight and Passenger Agent of the Chicago Terminal Transfer to become Vice-President of the Traffic Service Bureau, with headquarters at Washington, D. C., has been announced



Wm. B. Barr.

in these columns, was born in 1854 at Washington, Ind., and has been in the service of various transportation companies for about 25 years. He was formerly Assistant General Manager of Street's Western Stable Car Line, with office in St. Louis, and has also been connected with the freight departments of the Baltimore & Ohio, the Cleveland, Cincinnati, Chicago & St. Louis and other roads. He became General Freight and Passenger Agent of the Chicago Terminal Transfer in December, 1889, which office he now resigns. Mr. Barr has prepared various reports on existing and proposed terminal systems in different parts of the country, and in the performance of these and similar duties has been a close student of industrial conditions. He has been a contributor for several years to newspapers and magazines on transportation and allied questions.

Paul A. Rochester has been appointed the Freight Traffic Manager of the Hudson Navigation Co., with office at Pier 32, North river, New York, succeeding F. C. Earle.

Oliver T. Boyd, city passenger agent of the Pennsylvania at Washington, D. C., has been appointed the General Passenger Agent of the Hudson & Manhattan, with office at 30 Church street, New York.

E. M. Snyder, General Freight Agent of the Central of New Jersey, has been appointed the Assistant Freight Traffic Manager, with office at New York. This is a new position. Arthur Hamilton succeeds Mr. Snyder, with office at New York.

J. G. Love, Division Freight and Passenger Agent of the Chicago, Milwaukee & St. Paul at Des Moines, Iowa, has been appointed Assistant General Freight Agent, with office in Chicago, succeeding E. C. Nettels, resigned to engage in other business.

C. E. Hilliker, Commercial Agent of the Chicago, Milwaukee & St. Paul at Cleveland, Ohio, has been appointed a Division Freight and Passenger Agent, with office at Des Moines, Iowa, succeeding J. G. Love, promoted. T. H. Stoffel succeeds Mr. Hilliker, with office at Cleveland.

H. B. Kooser, Assistant General Freight Agent of the Missouri Pacific at Omaha, Neb., has been appointed the General Manager of the American Refrigerator Transit Company, with office at St. Louis, Mo., succeeding C. H. Holdridge, resigned to take service with another company.

C. E. Wagar, General Agent of the Missouri Pacific at Pueblo has been appointed the Assistant General Freight Agent, with office at Omaha, Neb., succeeding H. B. Kooser, resigned to enter service elsewhere. J. L. Amos, Contracting Freight Agent of the Missouri Pacific at St. Louis, succeeds Mr. Wagar.

Alvah N. Brown, whose appointment as General Freight and Passenger Agent of the El Paso & Southwestern System, with headquarters at El Paso, Tex., has already been announced in these columns, was born in Illinois in December, 1864. He received his education in the common schools and began railway work in 1885 with the Vandalia, with which he remained until 1887. From 1887 to 1897 he was in station service on the Atchison, Topeka & Santa Fe. From 1897 to 1899 he was Traffic Manager for the Receiver of the St. Louis, Kansas & Southwestern. From 1899 to 1901 he was Traffic Manager and Superintendent of the Kansas Southwestern. From 1901 to 1905 he was General Freight and Passenger Agent of the El Paso & Northeastern. From 1905 to May 1, 1909, he was General Freight Agent of the El Paso & Southwestern, and since May 1 he has been General Freight and Passenger Agent of the El Paso & Southwestern.



A. N. Brown.

Engineering and Rolling Stock Officers.

Howard R. Pratt, Engineer of Maintenance of Way of the Western Maryland, has been appointed Chief Engineer. This office has been vacant for about two years.

W. G. Seibert is appointed a Master Mechanic of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, with office at Fort Scott, Kan., succeeding T. F. Carbery, assigned to other duties.

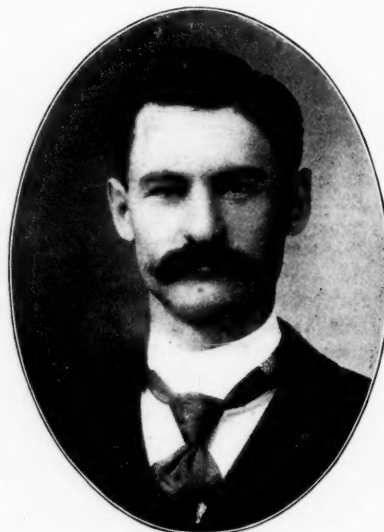
M. E. Hamilton has been appointed the General Air-Brake Inspector of the Atchison, Topeka & Santa Fe System, with office at Topeka, Kan. He will have full charge of all matters pertaining to air-brakes and Air-Brake Inspectors on instruction cars will report to him.

J. H. Rollo has been appointed the Supervisor of Bridges and Buildings of the Georgia, Florida & Alabama, with office at Havana, Fla., and A. J. Anderson has been appointed the Roadmaster, with office at Bainbridge, Ga. The office of Superintendent of Maintenance and Construction has been abolished.

E. Fischer, formerly Engineer of Bridges and Buildings of the Missouri Pacific, has been appointed Resident Engineer of the St. Louis, Brownsville & Mexico at Brownsville, Texas,

in charge of the construction of the bridge over the Denver & Rio Grande, which is being built jointly by the St. Louis, Brownsville & Mexico and the Mexican National.

Frank Lee Nicholson, recently appointed Engineer of the Norfolk & Southern, with office at Norfolk, Va., was born August 12, 1868, at Portsmouth, Va. After attending the Suffolk Military Academy for three years, from 1884 to 1887, he took a two years special course in civil engineering at the same time that he was engaged in railway work. He began railway work in 1887 as levelman on the Atlantic & Danville, now part of the Southern Railway. On August 1, 1888, he was made chief clerk and draftsman for the Chief Engineer, and a year later became levelman and transitman on the location work of the Wilmington, Newton & Norfolk, now part of the Atlantic Coast Line. In September, 1889, he was made Resident Engineer. By June 1, 1890, he had become Assistant Engineer of the Norfolk & Southern. On March 15, 1892, he was made Acting Engineer of Maintenance of Way, and on January 1, 1898, Engineer of Maintenance of Way, holding this position until his recent appointment. He is a member of the American Society of Civil Engineers, a charter member of the American Railway Engineering and Maintenance of Way Association, and vice-chairman of the Committee on Rules and Organization.



F. L. Nicholson.

OBITUARY.

George H. Harris, District Passenger Agent of the Lehigh Valley at Rochester, N. Y., died on May 22 at Rochester.

Joseph W. Drew, who died in Springfield, Mass., May 27, at the age of 84, was for many years a roadmaster on the Old Colony and was railway builder for General Sherman in Georgia, rebuilding the tracks in the country which was devastated on the march to the sea. Mr. Drew was born in Vermont and began his railway service as freight house laborer and brakeman in New Hampshire in 1845. He was a freight conductor on the Boston, Concord & Montreal and on the Boston & Maine. In company with Benjamin Bailey he was engaged in building the White Mountains Railroad, the Port Hope, Lindsay & Beaverton (Canada), the Passumpsic Railroad and a short railway in New Jersey. After the war he went to Boston and was roadmaster on the Old Colony for 37 years.

O. M. Shepard, General Assistant of the New York, New Haven & Hartford, died at his home in New Haven June 1 from acute gastritis. He was born in Cleveland, Ohio, in 1842, and began railway work in 1863 as despatcher in the United States military railway and telegraph service. By 1870 he had become Superintendent of Transportation and Assistant Superintendent of the Gilman, Clinton & Springfield, now part of the Illinois Central. In 1874 he was made Assistant General Superintendent of the St. Louis & South-eastern, now part of the Louisville & Nashville, and by 1880 had become Division Superintendent of the New York, New Haven & Hartford. He was made General Superintendent of the New York, New Haven & Hartford in 1886, and upon the reorganization and expansion of the road was made Superintendent of the New York division in March, 1890. In June, 1903, he was appointed General Superintendent and later was appointed General Assistant, acting in an executive capacity in the Operating department.

Railroad Construction.

New Incorporations, Surveys, Etc.

BENTON HARBOR-ST. JOE RAILWAY & LIGHT COMPANY.—Contract is said to have been given to McLane & Co., Detroit, Mich., for a 10-mile extension from Benton Harbor, Mich., northeast to Coloma. Contracts for material are said to be let as follows: Carnegie Steel Co., rails; Electric Service Supplies Co., overhead material; F. Cartwright, South Bend, Ind., poles; Lombard & Rittenhouse, Hastings, Mich., ties.

CANADIAN NORTHERN.—A contract for 25 miles on the Edmonton & Slave Lake, between Edmonton, Alb., and Athabasca Landing has been given to Malcolm McGrimmon, contractor, Edmonton. (March 19, p. 650.)

CANADIAN NORTHERN ONTARIO.—A subsidy contract has been entered into with the Canadian Government for building two lines of railway. One will run from Toronto, Ont., northwest, via the east side of Lake Simcoe to a point at or near Sudbury, 265 miles. The other line will run from Sudbury Junction, Ont., to Hutton Mines, 30 miles.

CENTRAL KENTUCKY TRACTION.—Contract is said to have been given to David Pepper, Jr., of Philadelphia, to build from Lexington, Ky., south to Nicholasville, 12 miles, and work is to be started at once by Smithurst & Allen, Philadelphia, Pa. J. B. Crawford, Genl. Mgr., and G. MacLeod in charge of construction, Lexington. (March 19, p. 652.)

EDMONTON & SLAVE LAKE.—See Canadian Northern.

ELK & LITTLE KANAWHA.—Contracts may soon be let to build from Gassaway, W. Va., on the Coal & Coke, west to a point near Rosedale, about 15 miles. C. F. Peyton, of Charlestown, W. Va., is the engineer in charge.

FITZGERALD & NORTHWESTERN.—Application will soon be made for a charter in Georgia to build about 80 miles of line from a point in Ben Hill county, north through Wilcox and Pulaski counties. W. R. Bowen, Pres.; J. G. Knapp and D. B. Jay, of Fitzgerald, and S. C. Price, of Douglas, are interested.

GRAND TRUNK PACIFIC.—Vice-President Wainwright is said to have definitely stated that work will possibly be started this summer on the branch from Melville, Sask., northwest to Prince Albert, and that the other branch lines north and south from Melville will be completed this summer. (May 7, p. 1007.)

GREAT NORTHERN.—According to press reports a branch is to be built from Wilsoncreek, Wash., south to Connell, at the junction of the Northern Pacific and Oregon Railroad & Navigation Co., about 60 miles.

IDAHO & WASHINGTON NORTHERN.—An officer writes that track laying will be started June 1 on the extension from Newport, Wash., north to Ione, 53 miles. (May 28, p. 1144.)

MISSOURI & NORTH ARKANSAS.—Preliminary surveys are said to be made for a branch from Letona, Ark., southwest to Whitman, about 15 miles.

MISSOURI INLAND & SOUTHERN.—The proposed route is from Rolla, Mo., south to Licking, 40 miles. Surveys to be started June 1 and construction to be under way this fall. (May 28, p. 1174.)

MISSOURI, KANSAS & TEXAS.—Press reports from Austin, Tex., indicate that W. B. Munson, of Dennison, Tex., representing the M., K. & T., has asked to be given a 90 days' option on the bonds of \$100,000, which has been raised in San Antonio, for building a railway from that city to Brownsville. The report says that Mr. Munson and engineers will make a trip over the route of the proposed line and if their report is favorable its construction will be undertaken by the M., K. & T. interests. The proposed line will probably cross the Rio Grande at Rio Grande City and make connection with the Monterey-Matamoros branch of the National Railways of Mexico. (See Texas Roads, Feb. 19, p. 381.)

PORTLAND RAILWAY, LIGHT & POWER COMPANY.—Plans are said to have been made for building about seven miles of new line in Oregon this year.

QUEBEC, MONTREAL & SOUTHERN.—A subsidy contract has been entered into with the Canadian Government for building a line from Yamaska, Que., northeast to a point in the county of Lotbiniere, 70 miles, and another from Mount Johnson, Que., to St. Gregoire, 1½ miles.

ROME & NORTHERN.—Organized in Georgia, with \$1,000,000 capital, to build from Rome north through Floyd, Chattooga, Walker, Whitfield and Catoosa counties to the Tennessee state line, about 80 miles. Contract said to be let to Burk & Joseph, of Cape Girardeau, Mo., for first 50 miles from Rome. Construction work is to be started at once. It is said some of the rails have already been ordered. Incorporators include R. G. Peters, R. A. Nickerson, J. R. Peters and R. H. Hoffman, of Manistee, Mich., and H. M. Smith, J. L. Bass, D. T. Haynes, H. H. Shackelton and others of Rome.

SAVANNAH & SOUTHWESTERN.—Application is said to have been made for a charter in Georgia to build about 400 miles of line from Savannah, Ga., west across the state of Georgia to Fort Gaines. C. M. Frank, F. R. Dunden, of Savannah; J. H. Perkins, W. G. Warnell and others are interested.

SHAWNEE ELECTRIC.—Incorporated in Oklahoma, with \$100,000 capital, to build from Shawnee, Okla., northeast via Prague and Okmulgee to Muskogee, 120 miles; also from Shawnee northwest to Oklahoma City, 40 miles. The incorporators include R. E. Pugh, C. S. Edwards, W. S. Pendleton and others, of Shawnee.

SOUTH CAROLINA ROADS.—According to reports from Bennettsville, S. C., John Ickes is interested in a company which proposes to build from Bennettsville north to Lackingham, N. C., about 35 miles.

SPARTA-MELROSE ELECTRIC RAILWAY & POWER CO.—See Western Transportation Co.

TROY MERCANTILE MILLING & POWER COMPANY.—Incorporated in Oregon, with \$20,000 capital, and office at Enterprise, Ore., to build an electric line from Troy, Ore., south to Hurricane creek, about 40 miles. R. W. Barkham and H. E. Merryman are interested.

VANCOUVER TRACTION.—According to press reports, surveys are now being made for an extension from Vancouver, Wash., east to Camas, 12 miles.

WESTERN TRANSPORTATION CO.—All the right-of-way has been secured by the Sparta-Melrose Electric Railway & Power Co. from Sparta, Wis., northwest via Angelo, Trout Falls and Cataract to Melrose, 28 miles. (March 19, p. 659.)

WESTMORELAND & REDBOILING SPRINGS (ELECTRIC).—Application has been made for a charter in Tennessee to build from Westmoreland, Tenn., east to Redboiling Springs, in Macon county, about 25 miles. A. R. Dean, E. K. Lamb, W. A. Smith, H. C. Smith and J. B. Kemp are interested.

WEST POINT & HOUSTON.—Organized in Mississippi with \$500,000 capital to build from West Point, Miss., northwest to Houston, about 30 miles. A large part of the right-of-way has been secured. J. A. McArthur, Pres.; J. R. Brinker, V.-Pres.; W. F. Lagrone, Secy., and L. T. Carlisle, Treas., associated with J. M. Hardison, A. F. Fox, J. L. Smith, W. F. Walker, K. Chandler, W. S. Keyes and J. M. White, directors.

A consular report says that a road train is being brought to Rangoon, India, to demonstrate the practical utility of this method of transport. The secretary of the Renard Transport Corporation of India is now in Rangoon in the interest of the company. Each vehicle of a train is mechanically steered so that it follows in the exact track of the preceding vehicle, and is equally effective when traveling backward. A train can turn a complete circle in a space 30 feet in diameter, backward or forward. A train usually consists of an 80-horsepower motor, with four carriages or less, which may be for either passengers or freight, as desired. The train is fitted with eight different speeds and can ascend a grade of 18 per cent. fully loaded. Each freight carriage has a maximum carrying capacity of five tons, and each passenger carriage provides accommodation for 25 to 30 persons. The maximum speed of such a train fully loaded, on a fairly hard level road, is 12 miles an hour. The size of the train may be increased up to six carriages, but the speed will be proportionately less. The trains are built in England and France.

Railroad Financial News.

ATCHISON, TOPEKA & SANTA FE.—The company is offering to stockholders the privilege of subscribing at 104 for an amount of 4 per cent. convertible bonds equal to 12 per cent. of their respective holdings of stock.

BALTIMORE & OHIO.—See Cincinnati, Hamilton & Dayton.

BOSTON & ALBANY.—The Massachusetts Railroad Commission has approved the issue of \$4,500,000 25-year 4 per cent. bonds the proceeds of the sale of which are to be used to pay for permanent additions and improvements.

CANADIAN NORTHERN.—The Dominion Securities Corporation, Toronto, Ont., has bought \$3,000,000 Canadian Northern, Winnipeg Terminal bonds.

CHICAGO, LAKE SHORE & EASTERN.—The Elgin, Joliet & Eastern has been leased to this road, the lease to go into effect on June 1 and run 50 years. Both roads are owned by the United States Steel Corporation and have many common officers, and it is said that the lease is made for the purpose of economy and convenience of management.

CINCINNATI, HAMILTON & DAYTON.—The plan for the readjustment of the affairs of this company, either through a foreclosure sale or without foreclosure, has been made public and it has it is understood the approval of the directors of the Baltimore & Ohio, J. P. Morgan & Co. and the bond and noteholders' protective committees. If foreclosure is brought it is to be on the consolidated mortgage of 1905, under which \$17,500,000 bonds were issued, of which \$15,000,000 are held as security for \$15,000,000 notes due September 1, 1908, and \$2,500,000 of which are held as security for demand notes. The consolidated mortgage is subject to \$23,729,425 underlying bonds, \$11,557,000 refunding bonds of 1904, \$2,141,000 receiver's obligations, \$1,046,000 unpaid interest and six months material claims to the extent that these claims may be determined to be a prior lien. To pay the debt of the company and to satisfy the holders of the \$15,000,000 4½ per cent. notes, it is proposed to authorize two new mortgages.

1. A first and refunding mortgage of July 1, 1909-1959, securing 4 per cent. bonds of a total authorized issue of \$75,000,000, of which \$27,500,000 are to be issued for the following purposes:

(a) For payment or adjustment of indebtedness.....	\$7,500,000
(b) For improvements now needed	5,000,000
(c) For necessary working capital	2,000,000
(d) For collateral	13,000,000

Total present issue\$27,500,000

There is to be reserved for future use:

(c) For additions, improvements and betterments.....	\$23,714,000
(f) For refunding underlying bonds.....	23,786,000

Of the bonds specified above (b), (c) and \$5,500,000 of (a) are to be guaranteed principal and interest by the Baltimore & Ohio; (d) bonds are to be pledged to secure \$11,557,000 notes due July 1, 1913, which notes are to be guaranteed by the Baltimore & Ohio, and the present 1904 refunding mortgage bonds are to be cancelled.

2. A general mortgage of July 1, 1909-1939 securing \$20,000,000 bonds bearing interest as follows:

From July 1, 1909, to June 30, 1911, 4½ per cent. dependent on income.

From July 1, 1911, to June 30, 1914, 1 per cent. absolutely and 3½ per cent. additional dependent on income.

From July 1, 1914, to June 30, 1916, 3 per cent. absolutely and 1½ per cent. additional dependent on income.

From July 1, 1916, on, 4½ per cent. absolutely.

None of the interest dependent on income is cumulative.

The holders of the \$15,000,000 4½ per cent. notes due September 1, 1908, are to receive for each \$1,000 note \$60 in cash [less than half the interest due and unpaid] and a new general mortgage bond for \$1,000, and the Baltimore & Ohio agrees that in July, 1916, or if the B. & O. shall acquire the controlling stock of the C., H. & D. earlier than that time, it will then either purchase at 85 the general mortgage bonds or at its own option give new 4 per cent. coupon bonds guaranteed by the B. & O. in exchange at par. In consideration of its part in the reorganization, the Bal-

timore & Ohio is to acquire the controlling interest in the stock of the C., H. & D. in July, 1916, at a price then to be fixed by arbitrators, and during the seven years from 1909 to 1916 the stock is to be vested in three voting trustees, one of whom is to be the President of the Baltimore & Ohio. [J. P. Morgan is the second and these two have chosen E. H. Harriman as the third trustee.] It has been arranged that until the purchase by the B. & O. of the controlling interest in the stock of the C., H. & D., a nominee of the \$15,000,000 noteholders' committee shall be a member of the board of directors of the Cincinnati, Hamilton & Dayton.

ELGIN, JOLIET & EASTERN.—See Chicago, Lake Shore & Eastern.

ERIE.—The company has sold the remainder, understood to be about \$4,500,000, of the \$15,000,000 6 per cent. collateral notes, which were issued in April, 1908, to provide for the refunding of obligations of the company maturing on or before July 1, 1909. The coupons due June 1 on \$709,500 New York & Erie fifth mortgage 4 per cent. bonds of 1858-1928 and on \$2,380,000 Buffalo, New York & Erie first mortgage 7 per cent. bonds of 1876-1916 were bought for cash and will be deposited as additional securities under the notes. Owing to the improved earnings of the company the issue of the \$30,000,000 collateral trust bonds recently authorized by the New York Public Service Commission under certain specified conditions has been postponed indefinitely.

GREAT NORTHERN.—The \$3,638,000 St. Paul, Minneapolis & Manitoba 6 per cent. second mortgage bonds maturing October 1, 1909, are being redeemed at par, the holders having the privilege, however, of exchanging them dollar for dollar for consolidated mortgage 4 per cent. bonds of the St. Paul, Minneapolis & Manitoba.

See Union Pacific.

KANSAS CITY, MEXICO & ORIENT.—At the annual meeting in Kansas City, Mo., on May 16, the Board of Directors was re-organized, a number of changes being made. The directorate formerly consisted mainly of citizens of Kansas City, but as the ownership of the stock has become widely diffused it was decided to choose a number of directors living at other places. The new board is composed as follows: A. N. Belding, New York; A. Monroe, Lawrence, Kan.; P. W. Goebel, Kansas City, Kan.; D. W. Mulvane, Topeka, Kan.; H. A. Stilwell, Chicago; J. T. Odell, New York; E. Dickinson, Kansas City, Mo.; A. E. Stilwell, Kansas City, Mo.; W. W. Sylvester, Kansas City, Mo.; John F. Allen, Rochester, N. Y.; C. R. Huntley, Buffalo, N. Y.; H. S. Manning, New York; W. D. Baldwin, New York; Thomas Evans, Pittsburgh; Frederick Roebbling, Trenton, N. J.; H. D. Estabrook, New York; Wm. H. McCord, New York; Chas. F. Ayer, Boston; H. A. Bishop, Bridgeport, Conn.; E. D. Stair, Detroit, Mich.; Isodoro Dia Lombardo, Mexico City; Manuel Calero, Mexico City; Garcia Cuellar, Mexico City.

MINNEAPOLIS & ST. LOUIS.—Tailer & Co. have bought \$600,000 5 per cent. equipment bonds. The bonds mature \$60,000 annually beginning 1910.

NEW YORK, NEW HAVEN & HARTFORD.—The Massachusetts Supreme Court has decided that the Park Square property in Boston, Mass., which was leased originally by the Old Colony Railroad from the Boston & Providence, belongs to the New York, New Haven & Hartford.

NORTHERN PACIFIC.—See Union Pacific.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—See St. Louis Southwestern.

ST. LOUIS SOUTHWESTERN.—The Valley Line of the St. Louis, Iron Mountain & Southern, running south from St. Louis, 119 miles, which has heretofore been operated under a short-term trackage agreement by the St. Louis Southwestern, has been leased under an agreement, understood to be for 50 years, by the St. Louis Southwestern.

UNION PACIFIC.—An arrangement has been made between the Northern Pacific, Union Pacific and Great Northern under which the Northern Pacific line running from South Tacoma, Wash., to Vancouver, about 135 miles, and the bridge over the Columbia river will be used jointly by the three companies. See this company under Railroad Construction.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Erie has closed a contract with the Fitz-Hugh, Luther Company to overhaul about 30 locomotives.

The Chicago & Eastern Illinois will repair 15 locomotives at its Danville shops for the St. Louis & San Francisco.

The Chicago, Rock Island & Pacific will overhaul 20 locomotives at its Silvis shops for the St. Louis & San Francisco.

The Harriman Lines have made a contract with the Baldwin Locomotive Works for building 105 locomotives. The numbers of each type and the allotments to the various roads are not yet decided. This equipment was referred to in the Railroad Age Gazette of May 28.

The Pennsylvania, as reported in the Railroad Age Gazette of May 7, is building at its Juniata shops 21 consolidation engines, 3 six-wheel switchers and 20 Atlantic locomotives.

General Dimensions.			
Type of locomotive	Consolidation.	Switch.	Atlantic.
Weight on drivers	211,000 lbs.	144,100 lbs.	124,100 lbs.
Weight, total	238,300	144,100	188,600
Cylinders	24 in. x 28 in.	20 in. x 24 in.	22 in. x 26 in.
Diameter of drivers	62 in.	56 in.	80 in.
Boiler, type	Belpaire.	Belpaire.	Belpaire.
" wrk. steam press	20 1/2 lbs.	20 1/2 lbs.	20 1/2 lbs.
Heating surface, tubes.	3,653 sq. ft.	1,762 sq. ft.	2,474 sq. ft.
" " firebox	187	106	166
" " total.	3,839	1,868	2,640
Grate area	55.13"	31.62"	55.55"
Tubes, number	465	247	315
" outside diameter	2 in.	2 in.	2 in.
" length	180 in.	163 1/2 in.	180 in.
Firebox, type	Wide firebox.	Wide firebox.	Wide firebox.
" length	110 1/4 in.	69 in.	111 in.
" width	72 "	66 "	72 "
" material	Steel.	Steel.	Steel.
Tank, capacity	7,000 gals.	5,500 gals.	5,500 gals. (13)
Coal capacity	35,000 lbs.	12,000 lbs.	25,000 lbs. (13)

Special Equipment.

Bell ringer	Hand only
Brakes	Penn. R.R.
Driving boxes	Penn. R.R.
Headlight	Penn. R.R.
Injector	Sellers and Nathan
Journal bearings	Penn. R.R.
Piston rod packings	Multi-angular metallic
Safety valve	Coale
Sanding device	(Consolidation) Leach, Sherburne and gravity
" "	(Switch and Atlantic) Sherburne and gravity
Sight-feed lubricators.	(Consolidation) 1/2 Nathan and 1/2 Detroit; (Switch and Atlantic) Nathan
Staying	Penn. R. R.
Steam gages	Crosby; (13 Atlantic) American
Steam heat equipment	(Atlantic) Gold regulator and McLaughlin Joints
Valve gear	Walschaerts
Wheel centers	Cast steel

CAR BUILDING.

The Philadelphia & Reading is in the market for 500 fifty-ton gondolas.

The St. Louis Southwestern will build 500 freight cars at its Pine Bluff shops.

The Philadelphia Rapid Transit has ordered 10 all-steel coaches from the Pressed Steel Car Co.

The Lehigh Coal & Navigation Co. has been figuring on specifications for from 25 to 50 coal cars.

The Central of New Jersey, as mentioned in the Railroad Age Gazette of May 28, is asking prices on 1,500 gondola and coal cars.

The Southern Cambria Railway, Johnstown, Pa., is said to have ordered 6 combination baggage and passenger cars from the Niles Car & Manufacturing Co. This is not yet confirmed.

The Grand Forks Street Railway Co., Grand Forks, N. Dak., is in the market for 4 second-hand single-truck trailers, 2 double-truck trailers and 1 double-truck motor, new or second-hand.

The Pennsylvania has been making contracts for some of

the 121 steel passenger cars for the Lines West, mentioned in the Railroad Age Gazette of May 21, but as we go to press the allotments have not been definitely decided.

The Chesapeake & Ohio, which was mentioned in the Railroad Age Gazette of May 21 as having ordered 500 hopper cars from the Pressed Steel Car Co. and 500 from the Standard Steel Car Co., has ordered 500 additional from the Standard Steel Car Co.

The Oregon Railroad & Navigation, as reported in the Railroad Age Gazette of May 21, has ordered one motor car from the McKeen Motor Car Co., and the Oregon & California has ordered one. These cars will weigh 60,000 lbs. and seat 48 passengers; each will have a 12-ft. 9-in. baggage compartment. They will measure 57 ft. long, 9 ft. 8 in. wide and 12 ft. high, over all. Bodies will be of wood and underframes of steel. They are for delivery September 1.

The Buffalo, Rochester & Pittsburgh, as reported in the Railroad Age Gazette of May 28, has ordered from the American Car & Foundry Co. three combination passenger and baggage cars for delivery September 1. These cars will carry 42 passengers. They will measure 65 ft. 3 3/8 in. long, 9 ft. wide and 8 ft. 10 1/8 in. high, inside measurements, and 71 ft. 11 in. long, 9 ft. 8 in. wide and 14 ft. 7/8 in. high, over all. The bodies will be of wood and the underframes of wood and steel. The special equipment includes:

Axles	Steel
Bolsters, body	Cast steel
Bolsters, truck	Cast steel
Brakes	Westinghouse
Brake-beams	Davis high-speed
Brake-shoes	Lappin steel back
Bolsters	B. R. & P. standard
Couplers	Janney
Curtain fixtures	Forsyth
Curtain material	Pantasote
Door fastenings	B. R. & P. standard lock
Door checks	Corbin
Draft gear	Westinghouse friction
Bust guards	Wood
Heating system	Consolidated
Journal boxes	Symington
Lighting system	Pintsch
Paint	Pullman standard
Platforms	A. C. & F. Co., design
Roofs	B. R. & P. pattern
Seat covering	Pantasote
Side bearings	Cast steel
Springs	Railway Steel-Spring Co.
Trucks	6-wheel, cast steel
Ventilators	Adjustable deck windows
Vestibules	Pullman standard
Vestibule diaphragms	Ajax
Vestibule trap doors	Edwards
Wheels	Solid steel
Window fixtures	Edwards

IRON AND STEEL.

The Copper Range has ordered 1,000 tons of rails from the Illinois Steel Co.

The Duluth, Missabe & Northern has ordered 1,250 tons of rails from the Illinois Steel Co.

The Lake Shore & Michigan Southern has ordered 15,400 tons of rails from the Illinois Steel Co.

The Grand Forks Street Ry., Grand Forks, N. Dak., is in the market for 360 tons of relaying steel.

The Chicago Western Indiana is reported in the market for about 1,000 tons of structural steel for bridge building.

The Chicago & Alton, reported in the Railroad Age Gazette of May 28 as being in the market for 10,000 tons of rails, has given this order to the Illinois Steel Company.

The Chicago, Rock Island & Pacific, reported in the Railroad Age Gazette of May 28 as being in the market for 22,000 tons of rails, has ordered about 26,000 tons from the Illinois Steel Company.

General Conditions in Steel.—One steel manufacturer is quoted as having said that the tariff question, as affecting the steel situation, has been lost sight of, due particularly to the low prices which have induced buyers to enter the market. It is suggested that consumers may themselves cause prices to rise in offering premiums for prompt shipments. The following statement, from the Wall Street Journal, probably best tells the conditions in general: "The United States Steel

Corporation is now producing at the rate of approximately 9,000,000 tons of finished and semi-finished steel, for sale, a year. This is the largest production in nearly two years. In 1907, an exceptionally good year, rolled and other finished steel products, for sale, aggregated 10,564,537 tons, so that the corporation is now operating within 1,500,000 tons of the total output of 1907. In 1908 the Steel Corporation produced, for sale, 6,206,932 tons, so that the present annual rate of production is about 2,800,000 tons in excess of what it was last year. The Steel Corporation is now operating about 77 per cent. of capacity. As capacity is much larger than it was in 1907, actual blast furnace production is within about 86 per cent. of the capacity in 1907."

RAILROAD STRUCTURES.

BOSTON, MASS.—The new grain elevator of the Boston & Albany at East Boston, which will form an important part of the new terminal, will be built by the Witherspoon-Englar Co., Chicago, at a cost of approximately \$1,000,000. The new elevator, which will be located on the northerly side of the company's property, and bordering on the Marginal, will have a capacity of 1,000,000 bushels, and will be 269 ft. long, 73 ft. wide and 187 ft. high. It will be operated by electricity and will have two double belts serving the conveyors and capable of delivering grain to four vessels at the same time. The building will be fireproof steel construction, with all modern appliances. The work of demolishing the old store houses on the site of the new elevator will begin at once. Contract also calls for a new grain dryer, which will be in a separate building adjoining the elevator. This building will also be fireproof construction, 46 ft. long, 28 ft. wide, 51 ft. high.

CANADIAN, TEX.—The Atchison, Topeka & Santa Fe will rebuild the roundhouse recently destroyed by fire. The structure will be an exact duplicate of the former one. (May 28, p. 1148.)

CHERRYVALE, KAN.—The Atchison, Topeka & Santa Fe has given a contract to O. Swanson & Sons, Topeka, Kan., for a passenger station.

CLEVELAND, OHIO.—D. C. Moon, General Manager of the Lake Shore & Michigan Southern, has sent a letter to the city council regarding the proposed Union station in which he speaks for his road, the Pennsylvania and the Cleveland, Cincinnati, Chicago & St. Louis. The council adopted a resolution on March 15, 1909, expressing the opinion that certain property in Lake View Park was a bargain at \$335 a front foot, aggregating the gross sum of \$3,000,000, and intimating that the railways ought to acquire it for the purpose of building a union station. Mr. Moon, in his letter, which was read to the city council on May 24, said that the railways' necessities are not of such a nature as to require the amount of ground stated. The principal reason for suggesting the use of so much ground appeared to be that the city's "group plan" of magnificent buildings must be supplemented and completed by an elaborate and costly station, far beyond the needs of the public or the railways now or in the near future. Mr. Moon suggested that if the city wishes such monumental works it would seem proper that it should contribute the land needed, especially in view of the fact that it is practicable to make a reasonable reconstruction of the present station by the addition of a moderate area of land. He added that the railways have not adopted or agreed on a plan for a station.

LOGGIEVILLE, N. B.—Sealed bids will be received by M. J. Rutler, chairman, Canadian Government Managing Board, Ottawa, until June 10, for a three-stall engine house, turntable, ring wall, freight shed, loading platform and a number of other additions.

MELBOURNE, WASH.—The contract for the first bridge for the Grays Harbor extension of the Union Pacific has been given to the Vulcan Iron Works Co., Seattle, Wash., at a cost of \$10,000. The structure will be used as an overhead crossing at a public highway.

OTTAWA, ONT.—Work on the new Grand Trunk hotel and station was commenced May 27. The building will be 300 ft.

long, 85 ft. wide and 40 ft. high. Foundations will be of blue limestone, main walls of brick, the cornices and faced work of sandstone and the approach canopy will be of iron and glass work. The main floor will have accommodations for mail, express and baggage departments, also the power-house and rest room for employees.

PEORIA, ILL.—The Illinois Traction System has given a contract to J. B. Jolst & Co., Peoria, Ill., for building a sub-station at Mackinaw. The company is also building 10 new depots and sub-stations combined on the system.

POND CREEK, OKLA.—The Chicago, Rock Island & Pacific will build a bridge across the Salt Fork river.

SAN ANGELO, TEX.—The Kansas City, Mexico & Orient will build a passenger station to cost about \$30,000, and a freight depot, 30 ft. x 140 ft., to cost about \$10,000. (April 23, p. 921.)

SPOKANE, WASH.—The Washington Water Power Co. will build a passenger station to provide better depot facilities for its interurban passengers. It will be a brick building 80 ft. long and two stories high.

TULSA, OKLA.—The Tulsa Street Railway Co. will build a car barn 80 ft. x 140 ft. The barn will have six tracks and store 24 cars. The company will also build a brick addition 50 ft. x 50 ft. to the present barn for shop purposes and install two new pits.

SIGNALING.

The New York State Public Service Commission, First district, has lately ordered automatic electric bells put up at a number of street crossings. One of these was on the New York Central in the village of Port Leyden, where citizens had asked to have the commission order flagmen or gates. The commission has lately ordered derails installed in the tracks of electric lines at certain crossings of steam railways. One electric railway thus using derails asked for permission to discontinue their use during the summer, but the commission declined to give such permission.

La Croix's Cab Signal.

On the Newark branch of the Erie Railroad last week experimental tests were made of a cab signal which had been fitted to an Erie engine by the Electrical Automatic Railroad Safety Signal Company, of New York. The acting president of the signal company is Jacob A. Cantor, formerly a Borough President in New York City. The inventor of the apparatus, Mr. La Croix, says that it "will make collisions impossible." The source of electricity is carried on the engine, and contact is made with the line wires by a shoe which comes in contact at proper points with a short piece of third rail. The apparatus is controlled, through suitable conductors, by track circuits, as in ordinary automatic block signaling. All of the vital circuits are normally closed, so that a break in the wire or failure of battery will give a stop signal. Mr. La Croix also has in the cab a recording instrument, by which he proposes to keep account of all operations and also of the time at which each operation takes place. The cab of the engine is also fitted with a telephone, which, when the engine is standing over a third rail, may be used to communicate with stations to which the line wire runs.

FOREIGN RAILWAY NOTES.

Machine tools imported into Great Britain during March were valued at \$37,108, as compared with \$61,961 in March, 1908. Exports amounted to \$223,836, as compared with \$127,155 in March, 1908.

Consul Julean H. Arnold, of Amoy, has prepared a printed catalogue of American trade catalogues, business directories and trade journals received at that consulate in China. He has sent a copy of this index catalogue to each importing firm in that district, telling them that all trade catalogues, business directories and trade journals received at this consulate from American manufacturers and dealers are properly catalogued and placed in the commercial library of this office.

Supply Trade News.

The Isthmian Canal Commission asks for bids until July 1 on valves for controlling the main culverts of the canal locks, including structural material, castings, bolts, washers, rubber, etc.

W. R. Mason, of Detroit, Mich., has been appointed Manager of the Jeffersonville, Ky., plant of the American Car & Foundry Co., New York, taking the place of G. A. Scanland, who has resumed his duties as Traveling Auditor.

The American Steel Foundries, Chicago, is equipping its plant at Indiana Harbor, Ind., to make manganese steel castings. The company has been making manganese steel castings for some time, but it is now going into this line more extensively.

C. A. Strom, of Richmond, Va., has been appointed Manager of the Rogers plant of the American Locomotive Co., New York. Frederick W. Cooke, who has been in charge of both the Rogers and the Cooke plants, remains in charge of the Cooke plant.

The Gold Car Heating & Lighting Co., New York, has received orders for the heating apparatus for 83 passenger cars and 22 locomotives for the Kansas City Southern. These cars and engines are not new; the heating equipment is to replace other equipment.

Fred A. Ebert, Western Railway Representative of the Garlock Packing Co., Palmyra, N. Y., died on May 23 at his home at La Grange, Ill. Mr. Ebert was born at Clyde, N. Y., in 1869. He was in business in Rochester for a number of years and about eight years ago went to the Garlock company. He was a regular attendant at the Master Mechanics' and Master Car Builders' conventions.

The Bucyrus Steel Castings Co., Bucyrus, Ohio, recently made what is said to have been the largest steel casting ever poured by a single ladle full of metal. It was a 25-ton bed-plate for a pumping engine. It measures 23 ft. 10 in. long, 72 in. wide and 64 in. high. The ladle contained 53,000 lbs. of basic open hearth steel and it took seven and one-half minutes to pour it. The casting was entirely successful.

The Federal Creosoting Co., Indianapolis, Ind., the incorporation of which was announced in the *Railroad Age Gazette* of May 7, was organized under the laws of Indiana for treating railway ties and timber for the Lake Shore & Michigan Southern by the Lowry creosoting process. The offices of the company are at 355 Dearborn street, Chicago. A plant will be built at or near Toledo, Ohio. Officers of the company are: President, Alvin T. Hert; Secretary and Assistant Treasurer, Harry W. Griffiths.

The H. W. Johns-Manville Co., New York, has taken the selling agency in the United States and Canada for the products of the American Hair Felt Co., which includes hair felt for all purposes. Baeder, Adamson & Co., Philadelphia, Pa., having discontinued the sale of hair felt, Henry J. Bellman, who for many years was connected with that branch of their business, has been appointed Manager of the hair felt department of the H. W. Johns-Manville Co., with headquarters at 100 William street, New York.

In the *Railroad Age Gazette* of May 21, page 1083, was an article by H. Herden, Chief Engineer of the Buffalo & Susquehanna Ry., entitled "A Suggestion for Tie Rods," in which was described and illustrated a simple device for preventing rails from spreading. Theodore Thomas & Co., Great Northern building, Chicago, advise that they are just now putting on the market an appliance called the Coover railway track brace, which is designed to serve the same purpose Mr. Herden describes, is built much along the lines suggested by him, and is already in successful use.

The April returns of the Western Electric Co., Chicago, make a slightly better showing than March, which was considerably the best month in the fiscal year to that time. April, 1909, is nearly 50 per cent. ahead of the returns for April, 1908. At present the Western Electric is operating at the annual rate of 65 per cent. of the record of 1906, when

sales were \$69,245,331, and about 85 per cent. of 1907, which was the second best year. The demand from railways for telephone switching service continues to gain and promises to become one of the most important branches of the company's operations. Demand for electrical supplies and electrical machinery is fully up to that of March, and the business in small and moderate size motors and generators is the best in the company's history.

R. H. Weatherly, formerly Third Vice-President in charge of sales of the Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., has bought an interest in the Pilliod Company, Old Colony building, Chicago, maker of the Baker-Pilliod locomotive valve gear. This latter company has been reorganized and the following officers elected: President, R. H. Weatherly; Vice-President, A. D. Baker; Secretary and Treasurer, F. E. Pilliod; Chief Mechanical Engineer, C. J. Pilliod. Mr. Weatherly has spent nearly his entire life in the railway supply business and has a wide acquaintanceship among both supply men and railway men. After finishing his education in 1892 he went into the car seat business, where he remained for about six years. He was later connected with the Safety Car Heating & Lighting Company, New York, and with the Shickle-Harrison-Howard Iron Company. On the organization of the American Steel Foundries, Chicago, in 1902, he became Assistant to the Second Vice-President, with office in New York. From 1905 to 1907 he was Third Vice-President of the Scullin-Gallagher Iron & Steel Co., in charge of the Eastern district, and in February, 1907, he was given charge of the entire sales of the company, with office at St. Louis.

TRADE PUBLICATIONS.

Torque and Its Relations to an Upper Quadrant Signal.—This is the title of a paper by W. H. Lane, of the Hall Signal Co., New York, which has been issued by that company in pamphlet form.

Denver & Rio Grande.—The company has issued a folder on the Alaska-Yukon-Pacific Exposition, in which the exposition grounds are described and illustrated, and information is given on railway fares and points of interest to be seen in the Rocky Mountains. There is also a map of the Denver & Rio Grande.

Chicago & North Western.—A folder has been issued by the company describing two circuit tours from Chicago and the East via Yellowstone and Lander, Wyo., respectively, through Yellowstone National Park, conducted by the Bryant Yellowstone Camping Company. It also gives an account of the trip by days and a map of Yellowstone Park.

Chicago, Milwaukee & St. Paul.—A veritable gem of the advertiser's art is the 1909 publication of this road on the summer resort regions of Wisconsin and Minnesota. The descriptive matter was prepared by the well-known magazine writer, Forrest Crissey, and is charmingly written. The illustrations are half-tone engravings from photographs of this region. The front cover is embossed in green and gold, with a colored half-tone.

Great Northern.—A folder relating to the Alaska-Yukon-Pacific Exposition is being circulated. The exposition grounds are described and illustrated and brief facts given about the exposition, including information on railway fares. There is a map of the Great Northern system, another of the city of Seattle, a plan of the exposition grounds and buildings, and a topographical map of the Great Northern showing the scenic route through the mountains. The company has also issued a folder giving information regarding schedules on the system and information for travelers.

Atchison, Topeka & Santa Fe.—A folder on Colorado is being circulated, in which descriptions and illustrations of points of interest to be seen are given. There is also a list of Colorado hotels and boarding houses and information regarding railway fares. The company has also issued a folder on California, with illustrations and brief descriptions of interesting places. It gives a list of the principal hotels and information regarding railway fares. Another folder of this

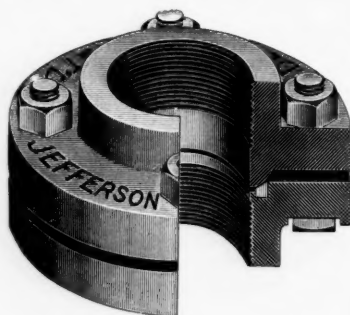
company gives brief descriptions of places to be seen along the Great Lakes and also a map of the Santa Fe System.

A New Flange Union for Heavy Work.

The accompanying illustration shows a new flange union, designed for heavy work. It is made of air refined furnace malleable iron, heavily cast throughout. The seat is of brass, cut from drawn brass tubing, so as to be free from sand or blow holes, which are common in cast brass. The seat is forced into an annular recess under pressure, after which the spherical seat is cut to receive the ball face of the opposite member, to which it is thoroughly ground. This insures a tight, secure and lasting joint, under pressure as high as 3,000 lbs.

The sectional portion of the illustration shows the brass seat to be set within the iron away from the inner bore of the fitting, so as not to be affected by the different temperatures in the pipe. This prevents the seat from becoming loose, due to the difference in expansion and contraction of the two metals, incident to severe usage. This method of placing the brass seat is protected by patents.

As the joint is spherical, it adjusts itself to piping which is several degrees out of alignment. This fitting is made in all sizes from 1 in. to 10 in., by the Jefferson Union Company, Lexington, Mass.

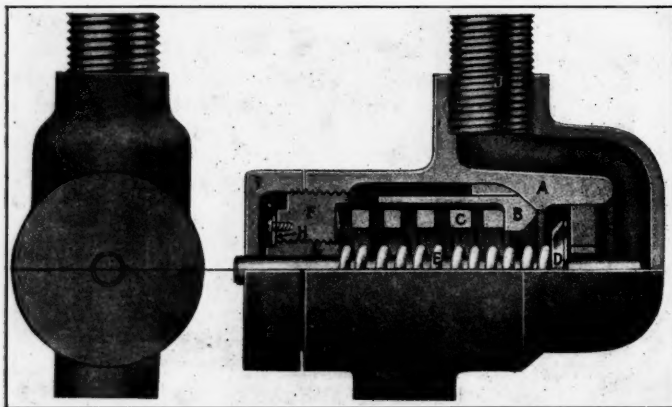


Jefferson Flange Union, Style D.

Miller Automatic Drainage, Relief and Compression Valve.

The accompanying illustration shows an automatic drainage, relief and compression valve for locomotives. One of the principal advantages of this valve is in its use in relieving the cylinder of the water of condensation. The normal position of the drainage valve D is open, which always provides a clear passage through a 1¼-in. port and prevents any accumulation of water.

The valve is compact and simple in construction. It consists of a



Miller Automatic Drainage, Relief and Compression Valve.

casing A, which has an inwardly extending portion, forming the seat of the abnormal, or high pressure, valve B, which is held in normal, or closed position, by the spring C, and opens when the pressure in the cylinder becomes excessive. The tension on the spring C is set slightly above boiler pressure. The seat of the drainage valve D is formed in the same casting with the valve B, which permits the valves to operate simultaneously when excessive pressure exists within the cylinder. The spring E operates to hold the drainage valve open when steam is shut off, and during drifting this valve is also open, thus reducing the vacuum and compression. It is claimed that this feature has demonstrated its usefulness in eliminating strains on the running gear of heavy, fast passenger locomotives equipped with Walschaert's valve motion and piston valves, especially when steam is shut off at a speed of 40 m.p.h., or greater. The valve springs C and E are adjusted by the nuts F and G, respectively. It is said that when the locomotive is running under a full head of steam the compression pressure keeps the drainage valve closed. In case of failure of the valve motion while running, such as the breaking of a rocker-box, the automatic action of the valve allows all steam to escape from the cylinder, and this prevents blowing out of the cylinder head.

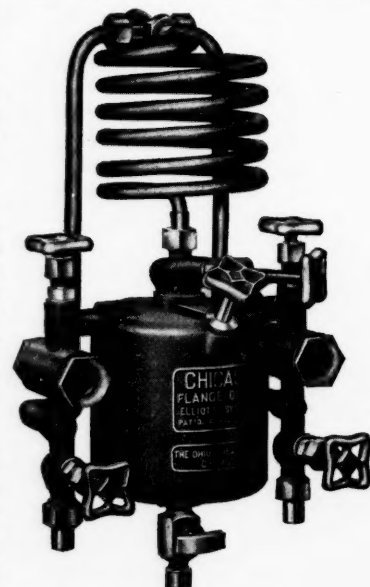
Notwithstanding rules to the contrary, cylinder cocks are often left closed after running the locomotive into the engine house. The water which collects in the piping and passages, is, if anything, detrimental, as it may be carried through the valves and cylinders. The Miller automatic valve allows all of this water to flow out as fast as it accumulates. A direct saving on this account is made in the oil and stuffing-box packings.

This device is patented by Franklin C. Miller, 20 Houghton street, Worcester, Mass., a New York Central engineman. He claims that these valves have been in continuous service on several locomotives, both passenger and freight, for the past six months, and that these locomotives have required less repairs than others not so equipped.

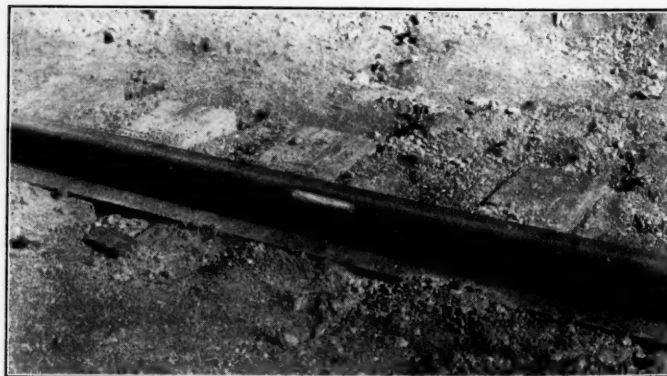
The Chicago Flange Oiler.

The Elliott system of flange lubrication was illustrated by a drawing in the *Railroad Age Gazette*, July 31, 1908, which explains its operation. This system of flange oiling is covered by patents which are controlled by the Ohio Injector Company, Chicago, and this company is now manufacturing the lubricator, and it is known as the Chicago flange oiler. They also supply the Chicago asphaltum flange oil, prepared especially for the purpose and found necessary for the successful operation of the lubricator.

The Chicago flange oiler consists of a down drop feed cup, fitted with solid glasses for sight feeds and with the necessary valves to place the system entirely within the control of the engine man. It consumes a very small amount of steam, because the only resistance to be overcome is that due to friction in the pipes. In connection with the low consumption of steam attention is called to the fact that the consumption of Asphaltum flange oil is also very low, considering the results obtained. One gallon of this oil will lubricate the wheel flanges for 500 to 800 miles, according to service and conditions. This flange oiler system was originated on the Santa Fe, Prescott & Phoenix, where it has been used since June 1, 1906. This line has many sharp curves and an equipment of 22 locomotives, and they report that no driving wheel flanges have been turned on account of sharp flanges since that time. During the year 1906, when the oiler was used only the last six months, 63 pairs of tender wheels changed on account of sharp flanges. For the year 1907 the number



Chicago Flange Oiler.



Section of Rail, Showing Coating of Asphaltum on Gage Side of Head.

was only 38, and for 1908, 21 pairs. The number of pairs of coach wheels changed in 1906 was 71, and the oiler reduced this to 29 in 1907 and 22 in 1908. The flange oiler is now being applied in large numbers by the Santa Fe, and is used experimentally by the Rock Island.

The halftone shows the exterior view of the flange oiler. The illustration of the rail shows in black the uniform coating of asphaltum on the gage side of the rail, and the white spot indicates where this coating has been scraped off with a knife.